Revised on 10/13/2022 (update NOE and Exam Info)

FIRE DEPARTMENT • CITY OF NEW YORK

STUDY MATERIAL FOR THE CERTIFICATE OF FITNESS EXAMINATION FOR SUPERVISION OF LNG (LIQUID NATURAL GAS) PLANT C-01

This book is provided to the public for free by the FDNY.

Note: The C-01 C of F was previously the C-10 C of F for Supervise LNG plant. C-10 C of F will continue to be accepted until the expiration date indicated on the C of F card. Upon the expiration date, the C-10 C of F must take and pass the new C-01 C of F exam to obtain the C-01 C of F to be authorized in supervising the LNG plant.

ATTENTION:

C-01/C-10 CERTIFICATE OF FITNESS IS FOR SUPERVISION OF OPERATIONS AT AN LNG PLANT.

C-01/C-10 Certificate of Fitness alone does NOT cover supervision of Sprinkler or Standpipe Fire Protection Systems.

IN ADDITION TO A C-01/C-10 CERTIFICATE OF FITNESS:

1. If your plant has a **SPRINKLER SYSTEM** installed, it is your responsibility to obtain an S-12/S-15 Certificate of Fitness.

2. If your plant has a **STANDPIPE SYSTEM** installed, it is your responsibility to obtain an S-13/S-14 Certificate of Fitness.

ALSO INCLUDED IN THIS BOOKLET YOU WILL FIND THE FOLLOWING:
NOTICE OF EXAMINATION (NOE)

Contents

EXAM SPECIFIC INFORMATION FOR C-01 CERTIFICATE OF FITNESS

Save time and submit application online!

Applicants who submitted and paid online for an exam before arriving at the FDNY will not need to wait in line to enter the FDNY.

It can take about 30 minutes to complete. Completing application and paying online will eliminate waiting outside in the long lines.

Instructions for online application and payment can be found here:
https://www1.nyc.gov/assets/fdny/downloads/pdf/business/fdny-business-cof-individuals-short.pdf

Create an Account and Log in to:
https://fires.fdnycloud.org/CitizenAccess/SAML/NYCIDLogin.aspx

REQUIREMENTS FOR CERTIFICATE OF FITNESS APPLICATION

General requirements:
Review the General Notice of Exam:
https://www1.nyc.gov/assets/fdny/downloads/pdf/business/general-notice-of-exam-cof.pdf

Special requirements: C-01 Certificate of Fitness

- Applicants must submit a letter of recommendation from his/her employer indicating that they have met all education and/or experience requirements (**see example of recommendation letter on the following page**).
  The sample of recommendation letter is also available online:
  http://www1.nyc.gov/assets/fdny/downloads/pdf/business/cof-c01-samplerec-letter.pdf
- Applicants must also provide certificate of completion from Massachusetts Fire Academy.

Application fee (Cash is NO LONGER ACCEPTED):
Pay the **$25** application fee online or in person by one of the following methods:

- Credit card (*American Express, Discover, MasterCard, or Visa*)
- Debit card (*MasterCard or Visa*)
- In person: Personal or company check or money order (*made payable to the New York City Fire Department)*

A convenience fee of 2% will be applied to all credit card payments.

For fee waivers submit: ***(Only government employees who will use their COF for their work- related responsibilities are eligible for fee waivers.)***

- A letter requesting fee waiver on the Agency's official letterhead stating applicant full name, exam type and address of premises; ***AND***
- Copy of identification card issued by the agency

<sample of recommendation letter>

FIRM OR COMPANY NAME
BUSINESS ADDRESS

Date: _____

Fire Department
Bureau of Fire Prevention
9 Metro Tech Center
Brooklyn, NY 11201-3857

Dear Sir/Madam:

As the supervisor of (NAME OF PLANT) located at (WORK PREMISES ADDRESS), I affirm that the applicant, (NAME OF APPLICANT) has a reasonable understanding of NYC Fire Rules sections pertaining to LNG, as well as the regulations of the NYS Department of Transportation.

(NAME OF APPLICANT) is knowledgeable of the provisions contained therein. Applicant is of GOOD CHARACTER and is PHYSICALLY ABLE to perform the functions required by the holder of this Certificate of Fitness.

This applicant has met **one** of the following criteria listed below:
(check the box that applies)

- ☐ Holds a Certificate of Completion from a technical school or program (the copy of the document is attached);
- ☐ Holds a Certificate of completion from Airframe and/or Powerplant (the copy of the document is attached);
- ☐ Has _____ year(s) of technical work experience at (the name of the LNG plant or other technical work environment). He/she has completed all required learning modules related to all technical equipment that he/she will use at the work location listed above.

In addition, this applicant has completed and understands the required specific training and modules regarding safety, hazardous material, handling of equipment at the plant as well as fire protection and fire suppression protocol. Such employee is selected on the basis of general understanding and experience with LNG plant operations, which includes and is not limited to: fire protection systems, refrigeration systems, processing, maintenance and repair, and transfer operations.

_____	_____	_____
(Printed name of Employer)	(Employer's title)	(Signature of Employer)

NOTE: ***The recommendation letter should be on employer's letterhead. If not on employer's letterhead, signature must be notarized.***

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REQUIREMENTS FOR ALTERNATIVE ISSUANCE PROCEDURE (AIP)

No AIP available. This certificate of fitness can only be obtained by passing the computer exam at the FDNY Headquarters.

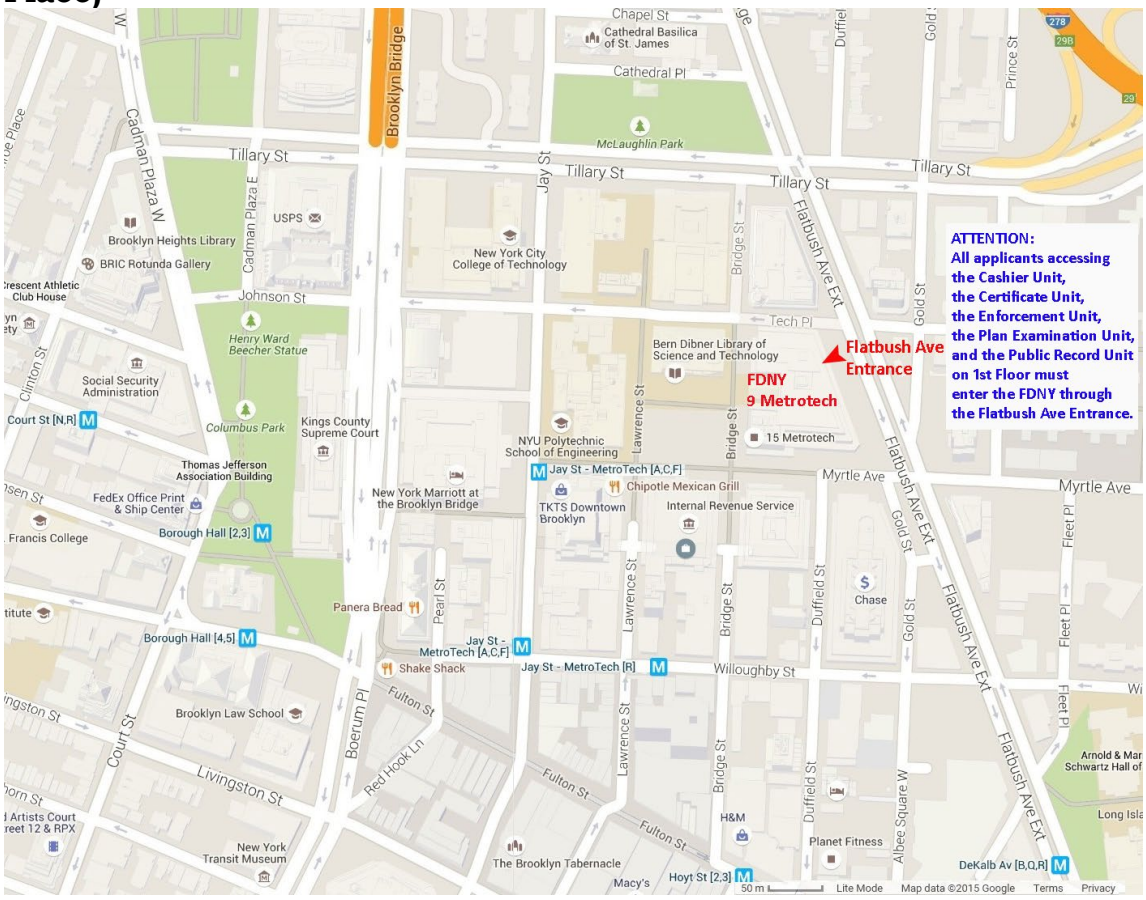
EXAM INFORMATION

The **C-01** exam will consist of **50** multiple-choice questions, administered on a "touch screen" computer monitor. Based on the amount of the questions and reference material provided, you will have 76 minutes to complete the C-01 test. A passing score of at least 70% is required in order to secure a Certificate of Fitness. Call (718) 999-1988 for additional information and forms.

Please always check for the latest revised booklet at FDNY website before you take the exam.

http://www1.nyc.gov/assets/fdny/downloads/pdf/business/cof-c01-noe-study-materials.pdf

EXAM SITE: FDNY Headquarters, 9 MetroTech Center, Brooklyn, NY. Enter through the **Flatbush Avenue entrance (between Myrtle Avenue and Tech Place)**



RENEWAL REQUIREMENTS

General renewal requirements:
Review the General Notice of Exam:
https://www1.nyc.gov/assets/fdny/downloads/pdf/business/general-notice-of-exam-cof.pdf

Special renewal requirements. C-01 Certificate of Fitness: None

QUESTIONS?

FDNY Business Support Team: For questions, call 311 and ask for the FDNY Customer Service Center or send an email to FDNY.BusinessSupport@fdny.nyc.gov.

1. ABOUT THE STUDY MATERIAL

This study material will help you prepare for the Certificate of Fitness examination for Supervision of *Liquefied Natural Gas.* It includes information taken from the New York City Fire Code and New York City Fire Rules. The exam covers this entire study material and any reference tables/charts. **Keep in mind that this study material will not be provided to you during the examination.** It is important that you read and understand this booklet to help you increase your chances of passing this test.

The study material does not contain all of the information you need to know to use, store and handle LNG. It is your responsibility to become familiar with all the applicable rules and regulations of the City of New York, even if they are not covered in this study material. In order to adequately prepare for the exam, you need to be familiar with the Fire Code Chapters 1, 9, 23, 27, and 32. Material will also come from Fire Rules Chapter 23-03. You shall also be familiar with NFPA 59a (2001) and NFPA 704 (2007). Applicants who work in NYC shall also be familiar with 49 Code of Federal Regulations 193.

EVERY LNG PLANT IS DIFFERENT

2022 FIRE CODE ENACTED

The amended New York City Fire Code, to be known as the 2022 Fire Code, takes effect on April 15, 2022. **It may not have been updated in this study material and the exam will be mainly based on this booklet, not the 2022 Fire Code. However, as the Certificate of Fitness holder, it is your responsibility to become familiar with the applicable sections of the new 2022 Fire Code.**

Design and installation provisions.

The design and installation provisions of the 2022 Fire Code shall apply to:

- Facilities established and conditions arising on or after 04/15/2022.
- Facilities and conditions not lawfully existing prior to 04/15/2022.

The facilities and conditions lawfully existing prior to the 04/15/2022 can be continued in compliance with the requirements of the former Fire Code/Fire Rule except as otherwise provided in the New Fire Code 102.5.

Operational and maintenance provisions.

The operational and maintenance provisions of the 2022 Fire Code, including permit and certification requirements, shall apply to all facilities, operations,

conditions, uses and occupancies, regardless of when they were established or arose.

Whenever this code is amended or a rule is promulgated to require a permit or certificate for a facility, operation, condition, use or occupancy, and no permit or certificate was previously required therefor pursuant to this code or the rules, such facility, operation, condition, use or occupancy may be continued without such permit or certificate until 04/15/2023, except as may otherwise be provided by such amendment or rule.

The 2022 Fire Code can be obtained via the following website:

http://www1.nyc.gov/site/fdny/codes/fire-code/fire-code.page

The 2014/2022 New York City Fire Code Cross-Reference Table can be referred to the following website:

http://www1.nyc.gov/assets/fdny/downloads/pdf/codes/fire-code-cross-reference.pdf

SAMPLE QUESTIONS

The following questions represent the "format" of the exam questions, not the content of the real exam.

1. Which of the following are allowed to be used while taking a Certificate of Fitness examination at 9 Metro Tech Center?

I. cellular phone
II. study material booklet
III. reference material provided by the FDNY
IV. mp3 player

A. III only
B. I, II, and III
C. II and IV
D. I only

Only reference material provided by the FDNY is allowed to be used during Certificate of Fitness examinations. The correct answer would be A. You would touch "A" on the computer terminal screen.

2. If the screen on your computer terminal freezes during your examination, who should you ask for help?

A. the person next to you
B. the firefighters in the testing room
C. the examiner in the testing room
D. the computer help desk

If you have a computer related question, you must ask the examiner in the testing room. The correct answer would be C. You would touch “C” on the computer terminal screen.

3. If you do not know the answer to a question while taking an examination, who should you ask for help?
A. the person next to you
B. the firefighters in the testing room
C. the examiner in the testing room
D. it is forbidden to ask anyone regarding test questions

You should not ask about examination questions or answers since FDNY staff cannot assist applicants with test questions. The correct answer would be D. You would touch "D" on the computer terminal screen.

2. DEFINITIONS

AGENCY HAVING JURISDICTION. Local authority having responsibility as prescribed in the Code of the City of New York, e.g., Fire Department, Department of Buildings, Department of [Ports and Trade] Small Business Services.

BARREL. A unit of volume, 1 barrel equals 42 U.S. gal.

BERM. Concrete or compacted earth structure constructed directly against or closely surrounding the container to a height 10% in excess of the design liquid level to serve as the primary impounding area.

BULK PLANT OR TERMINAL. Any premises upon which flammable or combustible liquids are received from marine vessel, pipeline, tank car or cargo tank and are stored or blended in bulk for the purpose of distributing such liquids by marine vessel, pipeline, tank car, cargo tank or container.

BULK TRANSFER. The loading or unloading of flammable or combustible liquids from or between marine vessels, pipelines, tank cars, cargo tanks or storage tanks.

CARGO TANK VEHICLE. A tank truck or trailer designed to transport liquid cargo.

CONTAINER. For solid and liquid hazardous materials, a vessel of 60 gallons (227 L) or less in capacity used for storage or transportation. For compressed gases, a cylinder, pressure vessel or tank designed for pressures greater than one atmosphere at 68°F (20°C). Pipes, piping systems, engines and engine fuel tanks associated with solid or liquid hazardous materials or compressed gases, shall not be deemed to be containers if in active use.

CONTROLLABLE EMERGENCY. An emergency where reasonable and prudent action can prevent harm to people or property.

CRYOGENIC. A fluid having a boiling point lower than -130°F at 14.7 pounds per square inch absolute (psia) (an absolute pressure of 101.3 kPa).

CRYOGENIC CONTAINER. A pressure container, low-pressure container or atmospheric container of any size designed or used for the transportation, handling or storage of a cryogenic fluid, and which utilizes venting, insulation, refrigeration or a combination thereof to maintain the pressure within design parameters for such container and to keep the contents in a liquid state.

CRYOGENIC GASES. Liquefied gases which exist in their containers at temperatures far below normal atmospheric temperatures, usually slightly above their boiling point at normal pressure, and correspondingly low to moderate pressures.

CRYOGENIC SYSTEM. An assembly of components, such as containers, reactors, pumps, compressors and connecting piping and tubing, designed to contain, distribute or transport cryogenics.

DESIGN PRESSURE. The pressure used in the design of components for the purpose of determining the minimum permissible thickness or physical characteristics of its various parts. When applicable, static head shall be included in the design pressure to determine the thickness of any specific part.

DISPENSING. The pouring or transferring by other means of any material from a container, tank or similar vessel, which would release dusts, fumes, mists, vapors or gases to the atmosphere, unless such release is prevented by a device, equipment or system designed for that purpose.

DIKE. Dike means the perimeter of an impounding space forming a barrier to prevent liquid from flowing in an unintended direction.

DOTn. United States Department of Transportation.

ESD. Emergency Shutdown**.**

ENGINEER OF RECORD. The owner shall appoint a professional engineer-of-record who shall have authority to act as liaison with the Buildings Department and Fire Department, file documents, comply with the Fire Department's requirements, file required reports and exercised resident supervision over construction, repair or modification and operation, during planning and construction and for a period of five years from completion.

FAILSAFE. Failsafe is the design feature which provides for safe condition in the event of malfunction of control devices, detection of fire or gas leak or interruption of any energy source.

FIRE DEPARTMENT CONNECTION. A connection, through which the Fire Department can pump supplemental water into the sprinkler system, standpipe, or other system furnishing water for fire extinguishment to supplement existing water supplies (**formerly known as a Siamese connection).**

FIRE GUARD. A person holding a Certificate of Fitness for such purpose, who is trained in and responsible for maintaining a fire watch and performing such fire safety duties as may be prescribed by the commissioner.

FIRE HOSE. A flexible conduit constructed with one or more reinforcements (jackets), with or without a coating or covering but with an approved non-permeable lining, or with an inner reinforcement between a protective cover and an approved non-permeable lining.

FIRE HYDRANT. A valve connection on a water supply system having one or more outlets and that is used to supply hose and fire department pumps with water.

FIRE PUMP. A pump that is a provider of liquid flow and pressure dedicated to fire protection. A fire pump is a part of a fire standpipe system's water supply and can be powered by electric, diesel or steam. The pump intake is either connected to the public underground water supply piping or a static water source (e.g., tank, reservoir, lake, or creek). The pump provides water flow at higher pressure and volume to the standpipe system risers and hose standpipes. A fire pump can also supply water to a sprinkler or a yard hydrant system.

FIRE WATCH. A temporary measure intended to ensure continuous and systematic surveillance of the premises by one or more qualified individuals for the purposes of identifying and controlling fire hazards, including detecting early signs of fire, raising an alarm of fire, notifying the Fire Department, and performing such other fire safety duties as may be prescribed by the commissioner.

FLAMMABLE CRYOGENIC. A cryogenic fluid that is flammable in its vapor state.

FLAMMABLE AND COMBUSTIBLE LIQUID STORAGE SYSTEM. A flammable or combustible liquid storage tank and all devices, equipment and systems associated with such tank, including the tank, piping, valves, fill connection, vent lines, pumps and any other ancillary equipment, except liquid motor fuel storage and dispensing systems and flammable and combustible liquid storage systems at a bulk facility or terminal used for bulk transfer operations.

FLAMMABLE LIQUID. For purposes of transportation, a flammable liquid defined in the regulations of the United States Department of Transportation, as set forth in 49 CFR Section 173.120. For all other purposes, a liquid, other than a compressed gas or cryogenic fluid, having a closed cup flash point below 100°F (38°C), classified as follows:

Class IA. Liquids having a flash point below 73°F (23°C) and having a boiling point below 100°F (38°C).

Class IB. Liquids having a flash point below 73°F (23°C) and having a boiling point at or above 100°F (38°C).

Class IC. Liquids having a flash point at or above 73°F (23°C) and below 100°F (38°C).

FLASH POINT. The minimum temperature in degrees Fahrenheit at which a liquid will give off sufficient vapors to form an ignitable mixture with air near the surface or in the container, but will not sustain combustion. The flash point of a liquid shall be determined by appropriate test procedure and apparatus as specified in ASTM D 56, ASTM D 93 or ASTM D 3278.

FULL CONTAINMENT CONTAINER. A container (not a dike) in which the inner (primary) container is surrounded by a secondary container designed to contain LNG in the event of a spill from the inner container and where the secondary container is enclosed by a steel or concreate roof designed such that excess vapor caused by a spill of LNG from the primary container will discharge through the relief valves.

GENERAL SUPERVISION. Supervision by the holder of any FDNY certificate who is responsible for performing the duties of the certificate holder but need not be personally present on the premises at all times.

HANDLING. The movement of a material in its container, the removal of the material from its container, or any other action or process that may affect the material, other than its storage or use.

IMPOUNDING AREA. Impounding area is an area which limits by dikes, berms or natural topography, the containment of spilled LNG, flammable refrigerants or other low flash liquids.

INCIPIENT STAGE FIRE. A fire which is in the initial or beginning stage and which can be controlled or extinguished by portable fire extinguishers, Class II standpipe or small hose systems without the need for protective clothing or breathing apparatus.

INITIATING DEVICE. A system component that originates transmission of a change-of-state condition, such as in a smoke detector, manual fire alarm box, or supervisory switch.

INPAIRMENT. Any condition in which a fire protection system cannot perform its designed fire safety function. Fire protection systems include sprinkler systems, standpipe/hose systems, fire pumps; fire protection water supplies, fire mains, fire alarm systems, and special extinguishing systems (ex. clean agent, carbon dioxide, wet/dry chemical, foam/water, etc.)

INSTALLATIONS. Installations includes tanks, liquefaction and vaporization facilities, processing equipment, piping and associated loading and unloading facilities, and all fire protection.

LIQUEFACTION. In the liquefaction process, natural gas is cooled to a temperature of approximately minus (-) 260 degrees Fahrenheit at ambient

pressure. This cooling process condenses the natural gas into a liquid form that takes up about 1/600th of the volume of natural gas in its gaseous state. Storage is facilitated by the volume reduction accomplished through converting the natural gas to a liquid state. Liquefaction allows for storage of a relatively large volume of natural gas in a peak shaving LNG plant tank as compared to what could be stored in a gaseous state.

LIQUEFIED NATURAL GAS (LNG). Liquefied natural gas means a gas in the liquid state composed predominately of methane and which may contain minor quantities of ethane, propane, nitrogen or other components common to natural gas. It is odorless, colorless, non-toxic and non-corrosive. Hazards include flammability after vaporization into a gaseous state, freezing and asphyxia. The temperature which liquefied natural gas boils is at about -260 degrees F (-162 degrees C).

LNG STORAGE VESSELS. LNG vessels or containers of more than 2,500 gallons capacity operating at not more than 2.5 psig.

LOCKOUT – process, which includes the placement of **STOP TAG** (also known as HOLD OFF TAG). The placement of a lock device on an energy isolating device to ensure the energy isolating device and the equipment being controlled cannot be operated until the lock device is removed. (See Tagout.)

PEAK SHAVING. Pipeline operators liquefy natural gas when demand is low and store the LNG until demand is high. Storage is facilitated by the volume reduction accomplished through converting the natural gas to a liquid state. During periods of high demand, the LNG is vaporized and injected into either the gas transmission system or a distribution system.

PLANNED OUT OF SERVICE CONDITION. The impairment coordinator shall be made aware in advance of any planned removal from service of a standpipe system, sprinkler system or fire alarm system, or system component, for repair, servicing, testing, maintenance, alteration, or to allow construction to be performed in the area protected by the system without unnecessarily activating it.

PURIFICATION. Components that will freeze at cryogenic temperatures (water, carbon dioxide, and heavier hydrocarbons) are removed and the remaining gas is chilled to about -260 degrees Fahrenheit, at which point the gas becomes a liquid. The Impurities in natural gas are removed prior to cooling to -260 F to prevent freezing of the impurities and causing a blockage. Heavy Hydrocarbon removal also controls end product composition in the LNG tank. It is important to note that the smell is removed during this process. Typical molecular sieve based purification skids remove the water, CO2 and smell from the natural gas and heavy hydrocarbon removal is accomplished as part of the chilling process.

SAFETY DATA SHEET (SDS). A document prepared in accordance with the regulations of the United States Department of Labor, as set forth in 29 CFR Part 1910.1200 or a federally approved state OSHA plan which sets forth information concerning a hazardous material. It contains health and physical hazards of the material used, procedures that should be followed in case of an emergency and safety work practices.

MAXIMUM ALLOWABLE WORKING PRESSURE. Maximum allowable working pressure means the maximum gage pressure permissible at the bottom of completed equipment, container or vessel in its operating position for a design temperature.

DRY POWDER NOZZLE

NOZZLES. A device for use in applications requiring special water discharge patterns, directional spray, or other unusual discharge characteristics.

ODORANT. Most commonly mercaptan, a sulfur compound added to natural gas to assist in its detection. The smell resembles that of leeks, onions or rotten cabbage.

OUT OF SERVICE SYSTEM. A fire protection system that is not fully functional; or whose operation is impaired or is otherwise not in good working order.

PRESSURE CONTROL VALVE. A pilot operated pressure reducing valve that may be used with a fire or booster pump designed for the purpose of preventing the incoming water supply pressure from dropping below a set pressure.

PRESSURE RELIEF DEVICES. A device designed to open to prevent a rise of internal pressure in excess of a specified value due to emergency or abnormal conditions.

PROCESS EQUIPMENT. Process equipment means all systems required to condition, liquefy, or vaporize natural gas in all areas of application referred to in these regulations.

PURGING. The act of removing the content of a pipe or container and replacing it with another gas or liquid.

PURGE INTO SERVICE. The act of replacing the air or inert gas in a closed system by a combustible gas, vapor, or liquid.

PURGE OUT OF SERVICE. The act of replacing the normal combustible content of a closed system by inert gas, air, or water.

SMOKE DETECTOR. A listed device that senses visible or invisible particles of combustion that is connected to a fire alarm system.

STANDPIPE SYSTEM. An arrangement of piping, valves, hose connections, and allied equipment installed in a building or structure, with the hose connections located in such a manner that water can be discharged in streams or spray patterns through attached hose and nozzles, for the purpose of extinguishing a fire, thereby protecting a building or structure and its contents in addition to protecting the occupants. Piping installed in a building or structure that serves to transfer water from a water supply to hose connections at one or more locations in a building or structure used for firefighting purposes.

SUB-SYSTEM. Sub-system is an activating (voluntary or required) fire alarm system installed in a specific area or floor for a specific purpose in a plant that has a required (mandated) base facility fire alarm system.

TANK, PROTECTED ABOVEGROUND. An atmospheric aboveground tank listed in accordance with UL 2085 or equivalent standard that is provided with integral secondary containment, protection from physical damage, and an insulation system intended to reduce the heat transferred to the primary tank when the tank is exposed to a high intensity liquid pool fire.

EXPLOSIVE LIMITS:

LEL. Lowest concentration (percentage) of a gas or vapor in air capable of producing a flash of fire in the presence of an ignition source (arc, flame, heat). Concentrations lower than LEL are 'too lean' to burn. Also called lower flammable limit (LFL). See lower flammable limit (LFL). Approximately 5% natural gas in air.

LOWER FLAMMABLE LIMIT (LFL). The minimum concentration of vapor in air at which propagation of flame will occur in the presence of an ignition source. The LFL is sometimes referred to as LEL or lower explosive limit.

UEL. Highest concentration (percentage) of a gas or vapor in air capable of producing a flash of fire in the presence of an ignition source (arch, flame, heat). Concentrations higher than UEL are 'too rich' to burn. Also called upper flammable limit (UFL). Upper explosive limit, 15% natural gas in air.

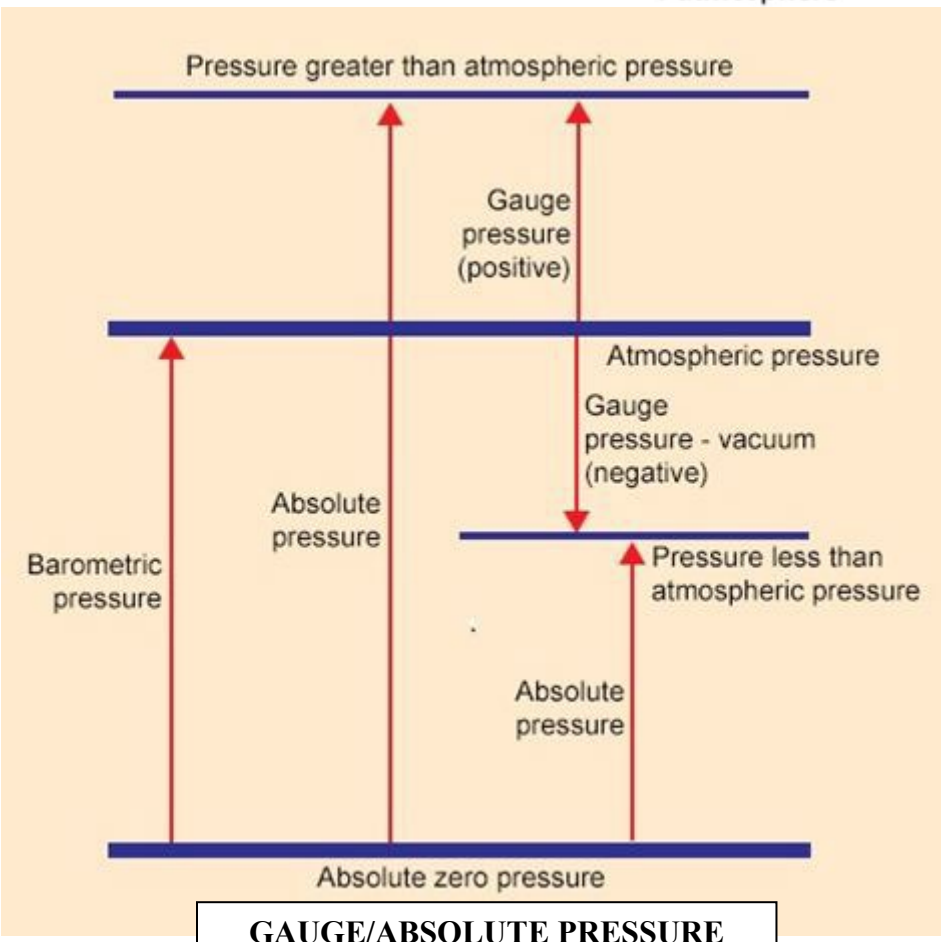
PERSONAL SUPERVISION. Supervision by the C-01 COF holder who is required to be personally present on the premises, or other proximate location acceptable to the FDNY, while performing the duties for which the certificate is required.

PRESSURE VESSEL. A closed vessel designed to operate at pressures above 15 psig.

PSIA. (ABSOLUTE PRESSURE) PSIA is a unit for pressure measured relative to a full vacuum. It is referred to as pounds per square inch absolute.

PSIG. (GAUGE PRESSURE) PSIG is the measurement of pressure relative to ambient atmospheric pressure and is quantified in pounds per square inch gauge.

PSIV. (Pounds Per Square Inch Vacuum) Pressure readings in the range from atmospheric pressure down to some lower pressure approaching absolute zero pressure.



GAUGE/ABSOLUTE PRESSURE

STANDARD CUBIC FEET (SCF). Cubic feet of gas at standard temperature and pressure. (Standard temperature is 60 degrees F; atmospheric pressure is at sea level - 14.7 psia).

STATIONARY TANK. A container having not less than 1,000-pound water capacity, designed primarily for stationary installations, and not intended to be moved in the course of normal use.

SUPERVISORY SIGNAL-INITIATING DEVICE. An initiating device such as a valve supervisory switch, water level indicator, or low air pressure switch on a dry-pipe sprinkler system in which the change of state signals an abnormal condition. A need for action in connection with guard tours, fire suppression systems or equipment, or maintenance features of related systems.

SYSTEM. An assembly of devices, equipment, containers, appurtenances, pumps, compressors and connecting piping that is designed to perform a complex and/or complete function.

SYSTEM, TANK. Low pressure (less than 15 psi) equipment designed for the purpose of storing liquefied natural gas consisting of one or more containers, together with various accessories, appurtenances, and insulation.

TAGOUT. The placement of a stop tag on an energy isolating device to indicate that the energy isolating device and the equipment being controlled may not be operated until the stop tag is removed. (See lockout).

TANK, ATMOSPHERIC. A storage tank designed to operate at pressures from atmospheric through 1.0 pound per square inch gauge measured at the top of the tank.

TRANSFER PIPING. A system of permanent and temporary piping used for transferring hazardous fluids between any of the following: Liquefaction process facilities, storage tanks, vaporizers, compressors, cargo transfer systems, and facilities other than pipeline facilities.

UNPLANNED OUT OF SERVICE CONDITION. Unplanned out of service conditions are serious defects such as empty tanks, breaks or major leaks in the system water piping, inoperative or shut water supply valves, defective fire department connections, etc. which render a standpipe system, sprinkler system or fire alarm system inoperable or otherwise causing it to no longer be in good working order.

UNWARRANTED ALARM. An alarm signal transmitted by a fire alarm system which failed to function as designed as a result of improper installation, improper maintenance, malfunction, or other factor. Examples of unwarranted alarms are alarms resulting from improper smoke detector placement, improper detector setting for installed location, lack of system maintenance, and control panel malfunction. It is important to know that the alarm verification feature reduces the number of unwarranted alarms.

VAPORIZER. A heat transfer facility designed to introduce thermal energy in a controlled manner for changing a liquid to a vapor or gaseous state.

> **AMBIENT VAPORIZER.** A vaporizer which derives heat from naturally occurring heat sources, such as the atmosphere, sea water, surface waters, or geothermal waters.

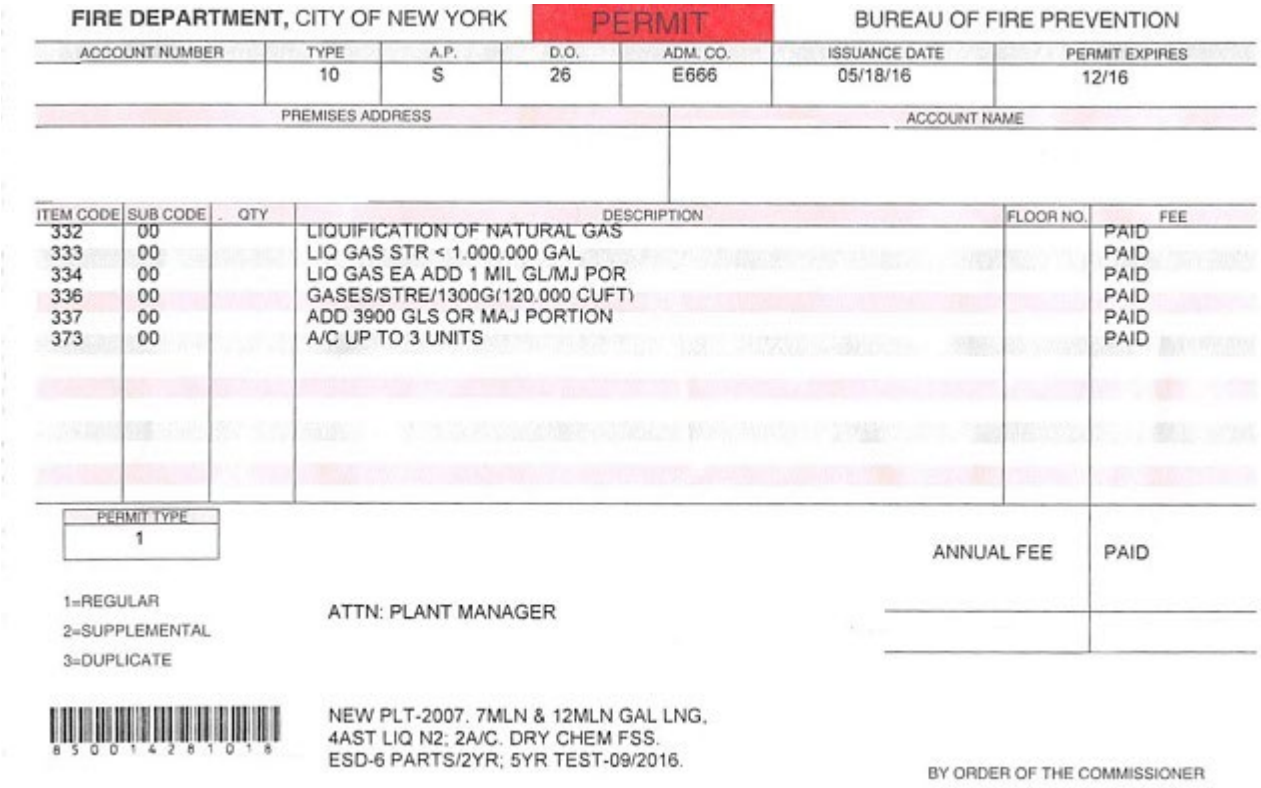
VAPORIZATION. An addition of thermal energy changing a liquid to a vapor or gaseous state.

3. INTRODUCTION

This booklet outlines Fire Department New York City regulations for the supervision of Liquid Natural Gas at LNG plant. This study material shall apply to all liquefied natural gas installations. Sections in this study material shall be applicable to LNG as it relates to land based facilities. This study material has information extracted from NYC Fire Code, NYC Fire Rules, 49 CFR (Code Federal Regulations) section 193, NFPA 59A (2001) and NFPA 704 (2007).

3.1 PERMITS

Various FDNY permits are required for operation of LNG plant. Permits vary based on the type of LNG plant, equipment as well as hazardous materials that are stored and handled at the plant. C-01 Certificate of Fitness holders should have knowledge of permit locations. They should check with plant management for details and information.



FIRE DEPARTMENT, CITY OF NEW YORK — PERMIT — BUREAU OF FIRE PREVENTION

ACCOUNT NUMBER	TYPE	A.P.	D.O.	ADM. CO.	ISSUANCE DATE	PERMIT EXPIRES
	10	S	26	E666	05/18/16	12/16

PREMISES ADDRESS — ACCOUNT NAME

ITEM CODE	SUB CODE	QTY	DESCRIPTION	FLOOR NO.	FEE
332	00		LIQUIFICATION OF NATURAL GAS		PAID
333	00		LIQ GAS STR < 1.000.000 GAL		PAID
334	00		LIQ GAS EA ADD 1 MIL GL/MJ POR		PAID
336	00		GASES/STRE/1300G(120.000 CUFT)		PAID
337	00		ADD 3900 GLS OR MAJ PORTION		PAID
373	00		A/C UP TO 3 UNITS		PAID

PERMIT TYPE: 1

1=REGULAR
2=SUPPLEMENTAL
3=DUPLICATE

ANNUAL FEE — PAID

ATTN: PLANT MANAGER

NEW PLT-2007. 7MLN & 12MLN GAL LNG, 4AST LIQ N2; 2A/C. DRY CHEM FSS. ESD-6 PARTS/2YR; 5YR TEST-09/2016.

BY ORDER OF THE COMMISSIONER

Example of an annual FDNY permit

Notice the information that is on the copy of the permit, such as:

- item and description
- location where the material is stored
- the quantities,
- as well as account information

3.2 CERTIFICATE OF FITNESS

Storage of LNG in quantities requiring a permit shall be under the **PERSONAL SUPERVISION** of a person holding a Certificate of Fitness.

Handling and use of LNG in quantities requiring a permit shall be performed under the **PERSONAL SUPERVISION** of a person holding a Certificate of Fitness.

3.3 RESPONSIBILITIES OF THE C-01 CERTIFICATE OF FITNESS HOLDER

In every LNG plant a full-time incipient stage fire brigade shall be maintained consisting of 3 operational employees thoroughly trained in the use of fire extinguishing equipment and tools and in the operation of the plant. At least 2 of the total of 3 employees required on each shift shall obtain C-01 Certificates of Fitness from the Fire Department to supervise the operation of the plant. Such candidates shall be selected on the basis of knowledge and experience in LNG plant operation, fire protection systems, refrigeration systems, processing, maintenance, repair, and transfer operations.

4. OPERATIONS

Each C-01 Certificate of Fitness holder shall follow one or more manuals of written procedures to provide safety in normal operation and in responding to an abnormal operation that would affect safety.

4.1 MANUAL OF OPERATIONS

The procedures must include provisions for:
(a) Monitoring components or buildings.
(b) Startup and shutdown, including for initial startup, performance testing to demonstrate that components will operate properly in service.
(c) Recognizing abnormal operating conditions.
(d) Purging and inerting components.
(e) In the case of vaporization, maintaining the vaporization rate, temperature and pressure so that the resultant gas is within limits established for the vaporizer and the downstream piping.
(f) In the case of liquefaction, maintaining temperatures, pressures, pressure differentials and flow rates, as applicable, within their design limits for:

- Boilers;
- Turbines and other prime movers;
- Pumps, compressors, and expanders;
- Purification and regeneration equipment; and
- Equipment within cold boxes.

(g) Cooldown of components.

4.2 C-01 CERTIFICATE OF FITNESS HOLDER TRAINING

4.2.1 SECURITY

(a) Personnel responsible for security at an LNG plant must be trained in accordance with a written plan of initial instruction to:

- Recognize breaches of security;
- Carry out the security procedures that relate to their assigned duties;
- Be familiar with basic plant operations and emergency procedures, as necessary to effectively perform their assigned duties;
- Recognize conditions where security assistance is needed.

(b) A written plan of continuing instruction must be conducted at intervals of not more than two years to keep all personnel having security duties current on the knowledge and skills they gained in the program of initial instruction.

4.2.2 FIRE PROTECTION

(a) All personnel involved in maintenance and operations of an LNG plant, including their immediate supervisors, must be trained according to a written plan of initial instruction, including plant fire drills, to:

- Know the potential causes and areas of fire;
- Know the types, sizes, and predictable consequences of fire; and

- Know and be able to perform their assigned fire control duties according to the procedures and by proper use of equipment.

(b) A written plan of continuing instruction, including plant fire drills, must be conducted at intervals of not more than two years to keep personnel current on the knowledge and skills they gained in the instruction under paragraph (a) of the section.

(c) Plant fire drills must provide personnel hands-on experience in carrying out their duties under the fire emergency procedures.

4.3 MONITORING OPERATIONS

Each component in operation or building in which a hazard to persons or property could exist must be monitored to detect fire or any malfunction or flammable fluid that could cause a hazardous condition. Manual of operation should have detailed summary of monitoring operations. This section must be accomplished by watching or listening from an attended control center for warning alarms, such as gas, temperature, pressure, vacuum, and flow alarms, or by conducting an inspection or test at intervals specified in the operating procedures.

4.4 DELIVERY OF GAS

Methods of delivery vary from plant to plant; however, typically method of delivery is via a transmission pipeline. It is important to note that the maximum allowable operating working pressure is 350 psig in NYC.

- **Transmission Pipelines**
  Commonly constructed of steel pipes 12 to 36 inches in diameter. Valves could be several miles apart. Pipelines often run through populated areas.

TRUCK LOADING/UNLOADING

At the moment trucking of LNG in New York City is prohibited because it is a cryogenic flammable gas (cryogenic flammable can't be filled in a container). It is important to know that trucking is allowed and is performed in other neighboring states.

TRUCKING AREA

5. LNG PRODUCT

5.1 INTRODUCTION

The United States relies on clean-burning natural gas for almost one quarter of all energy used. Natural gas has proven to be a reliable and efficient energy source that burns much cleaner than other fossil fuels.

Additionally, the hydrocarbon takes up significantly less space as a liquid than a gas; LNG is approximately 1/600th the volume of the same amount of natural gas.

LNG storage is like a savings account for the gas industry. During off peak natural gas usage is held in reserve. During peak usage, the LNG is vaporized, then odorized and re-introduced back to the systems to augment the distribution supply.

5.1.1 OPERATION OF LNG PLANT

The key components of the LNG chain include a liquefaction, vaporization, truck unloading/loading and storage. Certificate of Fitness holder must know the materials and location of where everything is stored in their plant.

The composition of the natural gas defines how it will be processed for transport, whether staying in its gaseous state or being transformed into a liquid. Natural gas from the well must undergo separation processes to remove water, acid gases and heavy hydrocarbons from the recovered natural gas. The next step in processing is determined by what type of transport the gas will undergo, and specifications are met according to the transportation system.

For LNG, additional processing is required before the condensation of the gas to remove the threat of crystallization liquefaction plant in the heat exchangers. Additionally, fractionation between methane and heavier hydrocarbons is performed during liquefaction. This way, after regasification it can be loaded directing into the distribution network of pipelines. Natural gas is liquefied by lowering the temperature of the hydrocarbon to approximately -260 degrees Fahrenheit (-160 degrees Celsius). This temperature drop liquefies the methane present in the natural gas, making transportation at atmospheric pressure in the form of LNG possible. LNG is mainly constituted of methane and generally contains ethane, as well. Liquefied Petroleum Gas (LPG) may also be present in the LNG.

When LNG is vaporized into its gaseous form, it will only burn when mixed with air in concentrations of 5 and 15%.

5.1.2 PROPERTIES OF LNG

LNG consists of approximately 97% methane and 3% ethane (it also contains trace quantities of propane and butane).

The way LNG is produced is by a cooling process of natural gas.

LNG is colorless and odorless; no odorant is effective when added to LNG because of the very nature of the product. LNG is non-toxic, however it is an asphyxiant. An asphyxiant will displace the oxygen that we need to survive.

Expansion ratio of LNG is approximately 600 to 1, so every cubic foot of liquid will create 600 cubic feet of vapor when you expand it. This is why natural gas is liquefied. For every truck load of liquid you would need 600 truckloads of vapor.

6. LNG PLANT

6.1 WHAT IS AN LNG PLANT?

An LNG plant is a facility for liquefaction, storage and vaporization (regasifyng) of the liquefied natural gas. Professional Engineers (PE), consultants and architects design these types of facilities; authorities (such as the NYC Department of Buildings, Department of Transportation, NYS Department of Environmental Conservation, the NYC FDNY, and US Government agencies) regulate the construction as well as the processes after they are built and commissioned to service.

6.1.1 MINIMUM CLEARANCES

Minimum clearances shall be maintained in accordance to section §23-03 of the NYC Fire Rules (see appendix B) between LNG containers, flammable liquid storage tanks, buildings, structures, plant equipment and plant property lines.

6.1.2 PROTECTION AGAINST NATURAL FORCES

Plant sites shall be protected from the forces of nature as flooding by rains, high tides, or soil erosion by grading, draining and dikes. Grass, weeds, trees, or undergrowth shall be cleared within 25 feet of any piping, container, or process equipment.

6.1.3 SECURITY FOR THE PLANT

Each C-01 Certificate of Fitness holder shall follow one or more manuals of written procedures to provide security for LNG plant.

THE PROCEDURES MUST BE AVAILABLE AT THE PLANT AND INCLUDE AT LEAST THE FOLLOWING:

- A description and schedule of security inspections and patrols performed;
- A list of security personnel positions or responsibilities utilized at the LNG plant;
- A brief description of the duties associated with each security personnel position or responsibility;
- Instructions for actions to be taken, including notification of other appropriate plant personnel and law enforcement officials, when there is any indication of an actual or attempted breach of security;
- Methods for determining which persons are allowed access to the LNG plant;
- Positive identification of all persons entering the plant and on the plant, including methods at least as effective as picture badges; and
- Liaison with local law enforcement officials to keep them informed about current security procedures under this section.

6.1.4 FENCE

A protective fence of incombustible material shall be erected at the property line, at least 8 ft. in height, having locked gates openable only to authorized persons on proper identification.

6.1.5 PROTECTIVE ENCLOSURES

The following facilities must be surrounded by a protective enclosure such as a fence:

(1) Storage tanks;
(2) Impounding systems;
(3) Vapor barriers;
(4) Cargo transfer systems;
(5) Process, liquefaction, and vaporization equipment;
(6) Control rooms/centers and stations;
(7) Control systems;
(8) Fire control equipment;
(9) Security communications systems; and
(10) Alternative power sources.

- The protective enclosure may be one or more separate enclosures surrounding a single plant or multiple facilities.
- Ground elevations outside a protective enclosure must be graded in a manner that does not impair the effectiveness of the enclosure.
- Protective enclosures may not be located near features outside of the plant, such as trees, poles, or buildings, which could be used to breach the security.

- At least two accesses must be provided in each protective enclosure and be located to minimize the escape distance in the event of emergency.
- Each access must be locked unless it is continuously guarded. During normal operations, an access may be unlocked only by persons designated in writing by the C-01 Certificate of Fitness holder.
- During an emergency, means must be readily available to all plant personnel within the protective enclosure to open each access.

6.1.6 CONTROL CENTER

Each LNG plant must have a control center from which operations and warning devices are monitored. A control center must have the following capabilities and characteristics:

- It must be located apart or protected from other LNG facilities so that it is operational during a controllable emergency.
- Each remotely actuated control system and each automatic shutdown control system required by this part must be operable from the control center.
- Each control center must have personnel in continuous attendance while any of the components under its control are in operation, unless the control is being performed from another control center which has personnel in continuous attendance.
- If more than one control center is located at an LNG Plant, each control center must have more than one means of communication with each other center.
- Each control center must have a means of communicating a warning of hazardous conditions to other locations within the plant frequented by personnel.

Control Board/Panel

6.1.7 TANKS

The maximum capacity of any LNG tank shall be 300,000 barrels.

6.1.8 DIKES

An outer wall of a component served by an impounding system may not be used as a dike unless the outer wall is constructed of concrete.

6.1.8.1 IMPOUNDMENT CAPACITY OF THE DIKE

Each impounding system serving an LNG storage tank must have a minimum volumetric liquid impoundment capacity of:

(a) 110 percent of the LNG tank's maximum liquid capacity for an impoundment serving a single tank;

(b) 100 percent of all tanks or 110 percent of the largest tank's maximum liquid capacity, whichever is greater, for the impoundment serving more than one tank; or

(c) If the dike is designed to account for a surge in the event of catastrophic failure, then the impoundment capacity may be reduced to 100 percent in lieu of 110 percent.

(A) DISTANCE REQUIREMENTS FROM INCOMPATIBLE MATERIALS

Incompatible materials shall be separated while in storage or use except

for stored materials in containers having a capacity of not more than 5 pounds or 0.5 gallon. Separation shall be accomplished by:

1. Segregating incompatible materials in storage by a distance of not less than 20 feet.
2. Isolating incompatible materials in storage by a noncombustible partition extending not less than 18 inches above and to the sides of the stored material.

(B) DISTANCE REQUIREMENTS FROM HAZARDOUS MATERIALS WHERE STORAGE EXCEEDS 20,000 SCF OF OXIDIZING FLUIDS

1-*All classes of flammable and combustible liquids above ground.*

(a) 0 gal to 1,000 gal	25 ft
(b) Over 1,000 gal	50 ft

2-*All classes of flammable and combustible liquids in belowground tanks or vaults*

(a) Horizontal distance from oxygen storage container to tank or vault	15 ft
(b) Horizontal distance from oxygen storage container to filling and vent connections or other openings to tank or vault	25 ft

3-*Flammable gases aboveground*

(a) Liquefied hydrogen (any quantity)	75 ft
(b) Other liquefied gas, 0 gal to 1,000 gal	25 ft
(c) Other liquefied gas, over 1,000 gal	50 ft
(d) Nonliquefied or dissolved gases, 0 SCF to 25,000 SCF	25 ft
(e) Nonliquefied or dissolved gases, over 25,000 SCF	50 ft

The distances mentioned in (B) shall not apply, where a fire barrier wall having a minimum fire resistance of 2 hours interrupts the line of sight between storage system and the exposure. In such cases, the 2-hour fire barrier shall be located at least 5 ft from any exposure.

7. PROCESSES

7.1 VARIOUS LNG PLANT PROCESSES

The procedures summarized below shall be followed when listed processes are employed. Before performing and following the procedures confirm and compare with your plants manual of operations.

7.1.1 VAPORIZATION AND LIQUEFACTION EQUIPMENT

After March 31, 2000, each new, replaced, relocated or significantly altered vaporization equipment, liquefaction equipment, and control systems must be designed, fabricated, and installed in accordance with requirements of CFR 193 and of NFPA-59A 2001.

7.1.2 COOLDOWN PROCEDURE

(1) Cooling down shall be limited to a rate and distribution pattern which will not cause allowable thermal stresses in the container and LNG piping to be exceeded.
(2) Cooldown shall be conducted by qualified and experienced personnel under the supervision of a C-01 Certificate of Fitness holder competent in this procedure.
(3) The container, associated piping and joints shall be under continuous surveillance to detect any failures or leaks.
- The cooldown of each system of components that is subjected to cryogenic temperatures must be limited to a rate and distribution pattern that keeps thermal stresses within design limits during the cooldown period, paying particular attention to the performance of expansion and contraction devices.
- After cooldown stabilization is reached, cryogenic piping systems must be checked for leaks in areas of flanges, valves, and seals.

7.1.3 BOILOFF AND FLASH GAS SYSTEMS

A boiloff and flash gas handling system separate from container relief valves shall be installed for the safe handling of vapors generated in the process equipment and LNG containers.

LNG containers shall have their boil-off and flash gases discharge safely to atmosphere or closed system, designed to prevent inbreathing of air. Provision may be made to introduce natural gas or nitrogen into the containers in the event a vacuum is experienced if the natural gas so introduced will not create a flammable mixture in the container.

7.1.4 OUT-OF-SERVICE

When the system, or a portion of the LNG system is placed out of service for a scheduled inspection, testing, regular maintenance, minor repairs or for construction, the C-01 Certificate of Fitness holder shall be made aware of and

authorize the placing of the system out-of-service. The requirements found in out-of-service procedure manual at LNG plant involve locking out and tagging out equipment from all energy sources (including electrical and gases) before C-01 Certificate of Fitness holders or vendors perform service or maintenance on such equipment. Only properly trained plant personnel are permitted to apply and remove stop tags in accordance with this procedure.

7.1.5 ISOLATING AND PURGING

- Before personnel begin maintenance activities on components handling gases and liquids which are isolated for maintenance, the component must be purged in accordance with a procedure which meets the requirements of "Purging Principles and Practices (incorporated by reference, see §193.2013)"; unless the maintenance procedures under §193.2605 provide that the activity can be safely performed without purging.
- If the component or maintenance activity provides an ignition source, a technique in addition to isolation valves (such as removing spool pieces or valves and blank flanging the piping, or double block and bleed valving) must be used to ensure that the work area is free of flammable fluids.

7.1.6 REPAIRS

(a) Repair work on components must be performed and tested in a manner which:
  - As far as practicable, complies with the applicable requirements of 49 CFR 193 Subpart D; and
  - Assures the integrity and safety of the component being repaired.

(b) For repairs made while a component is operating, each C-01 Certificate of Fitness holder shall include in the maintenance procedures appropriate precautions to maintain the safety of personnel and property during repair activities.

7.1.7 PIPE AND EQUIPMENT PURGING

Purging shall be conducted by experienced and qualified personnel under the direction of an experienced engineer competent in this specialty, AGA Purging Practices and Principles shall be followed. Responsibility and authority for the purging operations should be vested in a person who is familiar with the properties and nature of the materials involved and the construction and function of the equipment to be purged. The person should be capable of deciding how the purging should be done and of judging whether it is proceeding satisfactorily and when it is properly completed. He or she should be able to detect any hazards and to decide how best to overcome any difficulties that might arise.

- Prior to placing an LNG container and pipes into service the air must be displaced by an inert gas such as nitrogen in an acceptable manner so that at no time will there be a flammable mixture in the container or pipes.
- Prior to taking a container or pipes out-of-service the natural gas shall be purged with an inert gas such as nitrogen in a safe manner.

- During purging operation the interior of the container and pipes shall be continuously monitored for the presence of oxygen and flammable gas.

7.1.8 ISOLATING PURGING PROCEDURE

The C-01 Certificate of Fitness holder shall locate and identify all isolating devices to be locked out and tagged out. Below is a summary, each COF holder will need to comply with their own plants procedures.

The C-01 Certificate of Fitness holder should obtain a tag number and complete the Stop Tag Log, Stop Tag Detail Form and Stop Tag(s) as required. The information on the Stop Tag detail form shall include the:

- Supervisors name;
- Operators name;
- Work order number;
- Stop tag number;
- Date/time the stop tag is initiated.

The Certificate of Fitness holder shall notify any affected employee in the plant that a lockout/tagout procedure will be put into effect. The location of the equipment to be taken off-line; and the reason for the procedure should be given as well. The COF holder shall shutdown the equipment according to the applicable plant operating procedures.

7.1.9 CONTROL SYSTEMS (MAINTENANCE)

(a) Each control system must be properly adjusted to operate within design limits.
(b) If a control system is out-of-service for 30 days or more, it must be inspected and tested for operational capability before returning it to service.
(c) Control systems in service, but not normally in operation, such as relief valves and automatic shutdown devices, and control systems for internal shutoff valves for bottom penetration tanks must be inspected and tested once every 12 month, not exceeding 15 months, with the following exceptions:
   - Control systems used seasonally, such as for liquefaction or vaporization, must be inspected and tested before use each season.
   - Control systems that are intended for fire protection must be inspected and tested at regular intervals not to exceed 6 months.
(d) Control systems that are normally in operation, such as required by a base load system, must be inspected and tested once each calendar year but with intervals not exceeding 15 months.
(e) Relief valves must be inspected and tested for verification of the valve seat lifting pressure and reseating.

7.1.10 ISOLATION OF EQUIPMENT NOTES

- Stop tags used with this procedure shall be installed with a tie wrap or other similar items.

- A mechanic/operator and a supervisor shall sign the stop tag, and the stop tag detail form located in the LNG stop tag book.
- After removal and "logging out" of the stop tag, it may be discarded.
- If a control system is out-of-service for 30 days or more it must be inspected and tested by the C-01 COF holder for operational capability before returning to service.
- COF holder should follow AGA Purging Practices and Principles when performing isolation of equipment.

8. GENERAL REQUIREMENTS AND INFORMATION

8.1 HOUSEKEEPING

The C-01 COF holder shall make effort to maintain safe conditions on the premises at all times. The presence of foreign material, contaminants and ice shall be under control at the plant.

LNG plant grounds must be free from rubbish, debris, and other material which present a fire hazard. Grass areas on the LNG plant grounds must be maintained in a manner that does not present a fire hazard.

8.2 COMMUNICATION

Communications shall be provided at a plant so that the COF holder can be in contact with other remotely located personnel. Communication shall be by means of telephone, public address or two-way radio with audible alarm signals which can be heard throughout the plant actuated at the control house in case of emergency.

(a) Each LNG plant must have a primary communication system that provides for verbal communications between all operating personnel at their work stations in the LNG plant.

(b) Each LNG plant in excess of 70,000 gallons storage capacity must have an emergency communication system that provides for verbal communications between all persons and locations necessary for the orderly shutdown of operating equipment and the operation of safety equipment in time of emergency. The emergency communication system must be independent of and physically separated from the primary communication system and the security communication system.

(c) Each communication system required by this part must have an auxiliary source of power, except sound-powered equipment.

Means must be provided for:

(a) Prompt communications between personnel having supervisory security duties and law enforcement officials; and
(b) Direct communications between all on-duty personnel having security duties and all control rooms and control stations.

8.3 HAZARDOUS MATERIALS

The storage of hazardous materials shall be reported as required by the New York State General Municipal Law Section 209-u. The HMIS (Hazardous Material Inventory Statement) shall include the following information:

1. Product name.
2. Chemical composition.
3. Chemical Abstract Service (CAS) number.

4. Location where stored or used.
5. Container size.
6. Hazard classification.
7. Quantity in storage.
8. Quantity in use-closed systems.
9. Quantity in use-open systems.

HAZARD SIGNS - NFPA 704 DIAMOND SIGNS

Storage, handling and use of hazardous materials is accompanied in the NYC Fire Code by a requirement for the use of consistent signage to alert people, including first responders, to the presence of flammable materials in a plant. The intent of the signage is to provide an indication of the relative degree of harm that the material may pose. NFPA 704 system uses symbols, colors and numbers to readily communicate these concerns in a visual manner, and recognizes the fact that a material may pose more than one type of hazard.

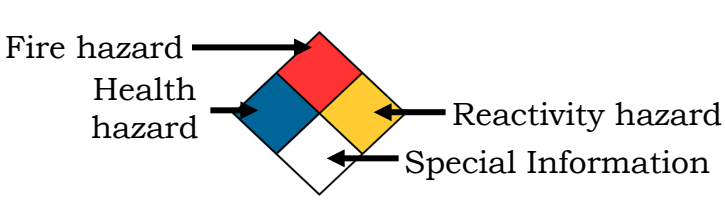
NFPA Rating Explanation Guide

RATING NUMBER	HEALTH HAZARD	FLAMMABILITY HAZARD	INSTABILITY HAZARD
4	Can be lethal	Will vaporize and readily burn at normal temperatures	May explode at normal temperatures and pressures
3	Can cause serious or permanent injury	Can be ignited under almost all ambient temperatures	May explode at high temperature or shock
2	Can cause temporary incapacitation or residual injury	Must be heated or high ambient temperature to burn	Violent chemical change at high temperatures or pressures
1	Can cause significant irritation	Must be preheated before ignition can occur	Normally stable. High temperatures make unstable
0	No hazard	Will not burn	Stable

RATING SYMBOL	SPECIAL HAZARD
ALK	Alkaline
ACID	Acidic
COR	Corrosive
OX	Oxidizing
	Radioactive
W	Reacts violently or explosively with water
W OX	Reacts violently or explosively with water and oxidizing

This chart for reference only - For complete specifications consult the NFPA 704 Standard

The basis of the system is a diamond-shaped sign that is divided into four color-coded quadrants (see below). The left-most quadrant is colored blue and represents the *health* hazard posed by the material, it is often referred to as the nine o'clock quadrant. The upper quadrant is red in color and indicates the relative *fire* hazard. The right-most quadrant is yellow and conveys the relative potential for *reactivity* of the material. The last quadrant, at the bottom, is white in color and serves to convey *"special"* information such as "OX" for oxidizer and "W" for water-reactive material.



Blank NFPA Diamond Sign

Sign with Hazards Indicated

The triggering amount for the sign requirement is the amount required for a permit.

8.4 PREMISES SIGNAGE

8.4.1 WARNING SIGNS

- Warning signs must be conspicuously placed along each protective enclosure at intervals so that at least one sign is recognizable at night from a distance of 30m from any way that could reasonably be used to approach the enclosure.
- Signs must be marked with at least the following on a background of sharply contrasting color:

The words "NO TRESPASSING," or words of comparable meaning.

WARNING SIGN

8.4.2 NO-SMOKING SIGNS

Open flames and high-temperature devices shall not be used in a manner that creates a hazardous condition.

It shall be unlawful to smoke on the plant premises. Sign such as the one on the right should be posted in areas where LNG is stored and handled.

8.5 LNG TANK SIGNAGE

Each LNG tank shall be identified by the installation of a permanent and legible plate at the ground level approach, with the following information:

- Builder's name and date built.
- Nominal liquid capacity in barrels.
- Design pressure for methane gas at top of tank.
- Maximum permissible density of liquid to be stored.
- Maximum level to which container may be filled with stored liquid and with water for testing purposes.
- Maximum temperatures in degrees Fahrenheit for which container was designed.

PIPE LABELING ON VAPORIZER

8.5.1 PIPE IDENTIFICATION

Process, fuel, high pressure steam, fire protection and other critical piping shall be identified by color coding, painting or labeling, subject to the approval of the Fire Department.

9. PLANT EQUIPMENT

9.1 OVERVIEW

Summaries below are of typical plant equipment and parts of equipment which are found at an LNG plant.

9.1.1 TANK

LNG storage tank is a specialized type of storage tank used for the storage of Liquefied Natural Gas. LNG storage tanks can be found in ground, above ground or in LNG carriers. The common characteristic of LNG storage tanks is the ability to store LNG at the very low temperature of -162 °C (-260 °F). LNG storage tanks have double containers, where the inner contains LNG and the outer container contains insulation materials. The most common tank type is the full containment tank. They vary greatly in size, depending on usage.

LNG containers shall be provided with pressure relief devices. Precautions shall be taken to prevent over-pressurization of atmospheric tanks. Such pressure relief devices shall communicate with the vapor space of the container, not the cryogenic fluid.

9.1.2 LIQUEFIER

The gas liquefier is a cryogenic unit which uses a pressure drop in the natural gas networks to power the natural gas liquefaction process. The gas liquefier includes a gas treatment and dehydration system, booster compressor, liquefaction unit, turbo-expander unit, and a control system.

9.1.3 PRESSURE AND VACUUM CONTROL

LNG containers and associated equipment and piping shall be provided with means of maintaining pressure and vacuum within design limits by admitting or discharging natural gas as needed.

9.1.4 VENTS

In addition to the pressure control means required under the foregoing, LNG containers shall be provided with dual sets of direct acting pressure and vacuum vents communicating with the atmosphere, with each set sized for total relief. Fire exposure must be considered in the sizing of pressure relief vents.

9.1.5 VALVES

Automatic equipment acceptable to the Fire Department shall be provided to prevent discharge of LNG or gas into a distribution system at a temperature above or below the design temperature of the sendout system.

9.1.6 SAFETY AND RELIEF VALVES

- Safety and relief valves shall be arranged to prevent damage. No shut-off valves are permitted in a line of relief, except 2 on top of the LNG tank. Relief valve settings shall be sealed.

- A thermal expansion relief valve shall be installed to prevent overpressure in any section of a liquid pipeline which can be isolated by valves. Thermal expansion relief valves shall be set to operate above the maximum normal operating pressure and less than the rated test pressure of the line it protects.

Discharge from such valves shall be directed to minimize hazard to personnel and equipment. Flammable liquids and gases shall be discharged to the plant system connected to an operating flare stack, except for the two relief valves on top of the tank which vent into atmosphere.

Pressure relief devices shall be provided to protect LNG containers and systems containing LNG from rupture in the event of overpressure.

Safety relief devices are used in all LNG containers, with one in the internal container to vent to the atmosphere what little gas has evaporated, and another in the outer container to vent any gas that may have accumulated between the walls of the inner and outer containers. If this second safety relief device vents, it is usually because there is a leak in the inner container. When releasing LNG from drain valves or blow down lines, you must open valves slowly to avoid splashing from the liquid. Safety release devices should be provided under all conditions. Safety and relief devices should be adjusted by authorized personnel familiar with the equipment. Frost built-up can prevent safety devices from operating properly.

Pressure Relief Devices

Heat exchangers, vaporizers, insulation casings surrounding LNG containers, and sections of coaxial or single wall piping systems in which liquefied cryogenic fluids could be trapped shall be provided with pressure relief devices. Cryogenic fluids should not be allowed to collect in piping without relief devices because as temperatures increase, expansion may cause the pipes to burst.

Pressure relief devices shall be sized in accordance with the specifications to which the cryogenic container was fabricated. The relief devices shall have sufficient capacity to prevent the MAWP (maximum allowable working pressure) of the cryogenic container or system from being exceeded. Pressure buildup because of evaporation may result from a loss of vacuum in the vacuum jacketed cryogenic gas container. It shall be unlawful to use pressure relief devices that are not clearly marked by the manufacturer with their set pressure. Pressure relief devices shall be located such that they are readily accessible for inspection and repair. They shall be arranged to discharge unobstructed, at rated capacity, to the outdoors in such a manner as to prevent escaping gas from impinging on personnel, cryogenic containers, equipment and adjacent structures or from entering enclosed spaces.
Exception: United States Department of Transportation has a specification for cryogenic containers with an internal volume of 2 cubic feet or less.

Nitrogen, argon, and other inert gases are non-combustible; that is, they do not present a fire hazard; however, if a system should rupture because of a fire, these gases may displace air to the point where there is not enough oxygen to support life. Excessive pressure build-up in piping and storage vessels can be prevented through proper selection of pressure-relief devices and flow control equipment.

Each vaporizer and/or heater shall be provided with a safety relief valve providing an effective rate of discharge. Relief valves must be inspected and tested once each year (not exceeding 15 months).

9.1.7 TEMPERATURE INDICATIONS

Temperature monitoring devices shall be provided in various locations of the LNG plant as follows:

(a) Temperature monitoring devices shall be provided in LNG containers to assist in controlling temperatures when placing the container in service and for calibrating liquid level gauges.
(b) Vaporizers shall be provided with indicators to monitor inlet temperatures of LNG, outlet temperatures of vaporized gas and heating medium fluids and stack temperatures.
(c) Liquefaction systems shall be provided with temperature monitoring devices upstream and downstream of process equipment.
(d) Temperature monitoring equipment and heating cables shall be provided where foundations supporting LNG containers and equipment could be adversely affected by freezing or frost heaving of the ground.

In addition to the foregoing there shall be sufficient temperature measuring instruments for floor, inner tank wall, outer tank insulation, roof and hung ceiling, and other indicators such as wall movement transducers, strain gauges, etc., that the Fire Department may require, to assure the prompt detection of an LNG leak or variation from the normal operating parameters in any container.

9.1.8 LIQUID LEVEL GAGING

Each LNG container shall be equipped with approved liquid level gauging devices acceptable to the Fire Department.

9.1.9 HIGH LEVEL ALARM

Each LNG container shall be equipped with approved liquid level alarm separate from the liquid level gaging device which will sound at the control house when the liquid level is between 95-98% of the maximum filling height. In addition, a visible alarm shall be provided in the control board at the control house.

*Certificate of Fitness holder shall consult their operations manual for precise filling level, and filling shall be done with caution as alarm may not be heard and filling takes a while.

Shall the filling bypass the high alarm it may overfill the tank which will cause a spill and may damage the tank, however the dike will prevent the LNG escape.

9.1.10 PRESSURE GAUGES

Each LNG container and pressure vessel shall be equipped with a pressure gauge connected to the container above the maximum liquid level. The LNG container shall also be provided with a pressure recorder. Pressure gauges shall be placed upstream and downstream of process equipment where trace contaminants in the feed stream may deposit, as an aid to the scheduling of deriming operations.

9.1.11 VACUUM GAUGES

Vacuum jacketed equipment shall be provided with instruments for checking the absolutely pressure in the annular space.

9.1.12 SHUT-OFF VALVES

Shut-off valves shall be provided on all LNG containers. Shut-off valves shall be located as close as possible to the containers, pipes and associated equipment they protect. Shut-off valves can't be installed on relief valves. However, on LNG tanks, relief valves are equipped with shut-off valves and they are locked.

9.2 SUMMARY OF EMERGENCY SHUT-DOWN PROCESS

- **Power or instrument air failure:**

Instrumentation for liquefaction, storage and vaporization facilities shall be designed so that in the event of power failure or instrument air failure the system will go into a "fail safe" condition until the system can be reactivated or secured.

- **Automatic shut-down:**
  Provision shall be made for automatic shut-down of major items of equipment, automatically in the event of fire detection or a major leak. In addition to the fire detection, the emergency shut-down shall include automatic activation of the fire extinguishing system in the area of detection, and shall include automatic notification to the Fire Department via a central office. The emergency shut-down shall be accompanied by audible and visible trouble signal at the control house and sounding of the plant alarm.

  Manual shut-down:
  Manual shut down may occur from several locations remote from the equipment and accessible in an emergency, and automatically in the event of fire detection or a major leak.

9.3 BLOCKING AND MANUAL VALVES

Automatic blocking valves of "failsafe" type shall be installed in addition to manual valves to limit and isolate leaks, and to protect the plant in case of fire or other emergency, as follows:

(a) Natural gas feed line to the liquefaction system (where it enters the plant).
(b) Natural gas feed line to the derime heater.
(c) LNG fill line from the cold box to the LNG container (at cold box).
(d) LNG withdrawal lines to/from booster pumps from the tank.
(e) LNG feed line to the vaporizers (at vaporizer).
(f) Natural gas line outlet from vaporizers to send-out line (near tank).
(g) Natural gas vapor boil-off line from tank to process area (near tank).
(h) Discharge line of the refrigerant compressor.

PROCESS AREA SIGN

(i) Additional valves for isolation shall be installed as required by the Fire Department.

9.3.1 AUTOMATIC BLOCKING VALVE OPERATION AND ACTIVATION

Automatic blocking valves shall be capable of manual operation and shall operate automatically on:

(a) Detection of fire at tank, dike, vaporizer or process area or fire endangering the valve.
(b) Indication of over-pressure (beyond maximum operating pressure) or under-pressure (leak or rupture).
(c) Actuation of emergency shut-down system, manually, or automatically at process control house or other selected sites.
(d) Manual operation of natural gas control valve.

9.3.2 ELECTRICAL EQUIPMENT

- SOURCES OF ELECTRICAL POWER

(a) Electrical control systems, means of communication, emergency lighting, and firefighting systems must have at least two sources of power which function so that failure of one source does not affect the capability of the other source.
(b) Where auxiliary generators are used as a second source of electrical power:
    (1) They must be located apart or protected from components so that they are not unusable during a controllable emergency; and
    (2) Fuel supply must be protected from hazards.

- SECONDARY ELECTRICAL POWER

  A secondary source of electrical power shall be provided sufficient for LNG control, venting, plant shut down, operation of fire protection equipment. Gas turbine or diesel drive may be accepted as satisfying this requirement. Such secondary power supply shall be so installed and arranged to provide for an uninterruptible switchover from primary to secondary power supply in case of primary power supply failure.

9.3.3 ELECTRICAL GROUNDING

All tanks, piping, and equipment shall be electronically grounded.

10. INITIATING DEVICES AND FIRE NOTIFICATION

A Fire Alarm System consists of components and circuits arranged to monitor and annunciate the status of fire alarm and supervisory signal-initiating devices, and to initiate the appropriate response to these signals.

THE PRIMARY PURPOSE OF FIRE ALARM SYSTEMS WITHIN PROTECTED PREMISES IS TO WARN PLANT OCCUPANTS AND TRANSMIT SIGNALS INDICATING A FIRE CONDITION TO THE FIRE DEPARTMENT VIA AN FDNY APPROVED CENTRAL STATION COMPANY.

Certificate of Fitness holders becoming aware of any fire are required to immediately notify 911. The Fire Department will respond. No supervisor or other person shall issue any directive or take any action to prevent or delay the reporting of a fire or other emergency to the Fire Department.

The Certificate of Fitness holder must know the locations of manual fire alarm system and portable fire extinguishers and how to operate them in an event of a small manageable fire. In addition to calling 911, the C-01 holder must activate the fire alarm systems manual pull station. Activation of the manual pull station will sound the alarm at the plant.

10.1 ALARM INITIATING DEVICES

Fire alarm systems that are manually activated use fire alarm pull stations (also referred to as manual fire alarm boxes). They shall be located near the exits throughout the protected area so that they are conspicuous, unobstructed, and accessible.

Manual fire alarm stations

The alarm stations used to activate the fire alarm system are called initiating devices.

- Single action stations require only one step to activate the alarm. For example, the alarm might be activated by pulling down on a lever. An example of a single action station is shown below.

The cover on these alarm stations serves as a lever. When the cover is pulled down, it allows a switch inside to close. This sends the alarm signal.

Single action stations

- Double action stations require two steps in order to activate the alarm. The employee must first break a glass, open a door or lift a cover. That person can then gain access to a switch or lever which must then be operated to initiate an alarm. To activate this type of alarm station the cover must be lifted before the lever is pulled.

Double action station

The Certificate of Fitness holder must know how to manually operate each alarm station on the premises. Once activated, the fire alarm system cannot be re-set at

the fire alarm manual pull station. The alarm must be re-set at a main FACP after the pull station is reset to its normal condition. The alarm may be silenced by a Certificate of Fitness holder. The Fire Alarm Control Panel shall only be reset at the direction of a Fire Department representative. Never reset the fire alarm system until the condition is verified. Once activated, a key may be required to reset the manual pull station.

DO NOT SILENCE PLANTS AUDIBLE / VISUAL DEVICE(S) OR RESET THE FIRE ALARM PANEL UNTIL THE FIRE ALARM CONDITION IS VERIFIED BY THE FDNY PERSONNEL.

The Fire Alarm Control Panel (FACP) monitors inputs and controls outputs through various types of circuits. FACP processes all abnormal conditions (alarm, trouble & supervisory) and indicates appropriately based on action programmed for the respective device. Once a manual pull station is activated, that device must be reset prior to resetting at the main FACP.

FIRE ALARM CONTROL PANEL

Three types of signals initiated by the FACP:

- **Alarm Signal:** A signal initiated by a fire alarm initiating device such as a manual fire alarm pull station, automatic fire detector, water flow switch, or other device in which activation is indicative of the presence of a fire or fire signature. When a fire signal is generated, the FACP activates the facility audible and visual devices connected to the fire alarm (i.e. horn/strobes),

sends a signal to an FDNY approved central station, and activates control of certain facility function which will be described later in this study material. In some cases it may initiate a plant shut-down.

- **Supervisory Signals:** A supervisory signal indicates a system or device being monitored which has been compromised or is in an abnormal state. A supervisory signal will audibly annunciate at the FACP to indicate the supervisory condition which needs to be investigated and corrected. A visual message will appear on the screen, without any field device activation. The FACP will also send a supervisory signal to an FDNY approved central station. The supervisory signal does not get send to FDNY, however, the COF holder is contacted so that they are made aware of the situation and plant procedures are followed. Supervisory signals are designed to make personnel aware of changes in the monitored system to prevent a potentially unsafe condition (ex. monitoring of valves).

- **Trouble Signals:** A signal initiated by the fire alarm system or device indicative of a fault in a monitored circuit or component. A trouble signal will audibly annunciate at the FACP to indicate that the trouble condition needs to be investigated and corrected. The trouble signal will be sent to the central station who would notify the LNG plant, but not the FDNY. Common trouble conditions monitored by the FACP would be battery condition, alternative current failure (electric), ground fault, open or short circuit on a wire, phone line failure, or internal component failure. The battery backup will take over in the event of a power outage.

ACKNOWLEDGE switch or button

An acknowledge button, also abbreviated as (ACK) is used to acknowledge an alarm, trouble or supervisory condition. The sequence of operations may differ in various fire alarm systems; however, it is necessary for the C-01 COF to report to the FACP location whenever the alarm is activated.

10.2 IN CASE OF AN ALARM

Alarm silence switch or button

The alarm silence switch is used to silence the plants audible devices while the source of an alarm is being investigated. Depending on the configuration of the alarm system, this function will silence the system's notification appliances completely, with strobe lights continuing to flash. The silence switch does not prevent a signal from being transmitted to a FDNY approved central station company. Audible silence allows for easier communication for facility personnel while responding to an alarm.

System reset switch or button

This switch is used to reset the fire alarm system after an alarm condition has been cleared. All initiating devices should return to normal condition after manually resetting.

Another alarm will be generated if an initiating device is still in alarm after the system is reset, such as smoke detectors continuing to sense smoke, or a manual pull station remaining in an activated position.

A system reset is often required to clear supervisory conditions. A system reset does not clear trouble conditions. Most trouble conditions will clear automatically when conditions are returned to normal.

A FACP indicating an alarm signal cannot be reset to "normal" if the device or devices signaling the alarm to the FACP have not returned to "normal" from "alarm".

10.3 SUPERVISORY DEVICES

Supervisory devices are commonly installed as part of a LNG plant. The supervisory devices monitor important parts of the system. A supervisory alarm, causing audibility at panel will be sounded when there is an abnormal condition with a system or device being monitored. This type of signal is commonly called a supervisory signal. The signal is always transmitted to the main control panel. When a supervisory condition is indicated, the Certificate of Fitness holder must check the system in order to identify the part of the system that caused the signal. Then that part of the system should be dealt with as per plant requirements.

Some control panels indicate the exact location of the trouble. Other panels only display a general supervisory signal. For example, a lighted panel might indicate only that there is a problem somewhere in the fire protection system. Each supervised device must then be inspected to determine which part is causing the signal.

Common supervised conditions include:

1) Oxygen Sensor
2) Control Valves
3) Pressure Valves
4) Electric Fire Pumps
5) Gas Detectors

TAMPER SWITCH ON A SPRINKLER VALVE (VALVE POSITION)

SUB-SYSTEM

A Sub-System is an activating (voluntary or required) system installed in a specific area or floor for a specific purpose in a plant that has a required (mandated) base facility fire alarm system. Example of different sub-systems include gas detection, U.V. detection, and heat detection systems that are connected to the total fire alarm system at the plant.

All such Sub-Systems shall be maintained in proper working order, and a person holding a COF shall be in charge of the supervision of all such activating systems. A detailed record of such system shall be kept available for examination by the NYC Fire Department.

All Sub-Systems shall be interconnected to the base facility fire alarm system for alarm and trouble supervision and shall annunciate specific type and location of such sub-system(s).

Activation of the sub-system shall activate the base facility audible and visual appliances, and notify the Fire Department via the base facility Central Station.

10.4 AUDIO AND VISUAL NOTIFICATION DEVICES

A fire alarm system component such as a bell, horn, speaker, strobe light or text display that provides audible, tactile or visible out puts or any combination thereof. These devices connect to the base system.

Horns, Horn/Strobes

Combination speaker / strobe appliances

SPEAKER

SPEAKER STROBE

GONGS/BELLS

10.5 INITIATING DEVICES

The plant personnel are responsible for ensuring that the fire and life safety systems are maintained in good working order at all times. Service personnel shall have the qualifications set forth in NFPA 72 standard for inspecting, testing, servicing and otherwise maintaining such systems.

The owner of any premises, or part thereof, monitored by a fire alarm system or sub-system thereof, whether required or not required by this material, which automatically transmit signals to the Fire Department or to a central station, shall be responsible for preventing unnecessary and unwarranted alarms as set forth in the NYC Fire Rules.

Maintenance of the initiating devices shall be performed as required by the NYC Fire Rules.

SMOKE DETECTOR

10.5.1 SMOKE DETECTOR

A smoke detector is a device that detects visible or invisible particles of combustion. Smoke detectors have been proved to be very effective in reducing fire damage and loss of life. There are several kinds of smoke detectors. Most smoke detectors work either by optical detection (photoelectric) or by physical process (ionization) while multi-sensor detectors use both detection methods to increase sensitivity to smoke. Modern smoke detectors also may have a heat sensor built in. When smoke detector reports the need for maintenance to the fire alarm control panel, it must be cleaned within 1 week.

UV/IR Detector

10.5.2 FLAME (UV, IR) DETECTOR

A UV detector is a device which uses photoelectric cells to detect the presence of UV rays. IR sensors perform similar tasks; however, they use different technologies. An infrared sensor is a device that detects an image using infrared radiation, similar to a common camera that forms an image using visible light.

DUCT SMOKE DETECTOR

10.5.3 DUCT SMOKE DETECTOR

Is designed to sample air flow in a duct and detect the presence of particles of combustion.

10.5.4 HEAT DETECTOR

A sensor that detects abnormally high temperatures or rate of temperature rise. Heat detectors have been shown to be very effective in reducing fire damage.

HEAT DETECTOR

Heat detectors are available in two general types: rate-of-rise and fixed temperature. C-01 COF holders are responsible for ensuring that operational heat detectors are in place. The rate-of-rise heat detectors activate the alarm when the room or surrounding area temperature(s) increases at a rapid rate. This type of detector is designed to reduce false alarms because of higher stable temperatures. The rate-of-rise heat detector does not have to be replaced after it has activated the fire alarm.

RATE-OF-RISE HEAT DETECTOR

All heat detectors require special attention. They must be carefully installed according to the manufacturer's instructions.

Fixed-Temperature Heat Detectors activate the alarm when the detector senses the temperature above the devices preset temperature level.

HEAT DETECTOR WITH PROTECTIVE MECHANICAL GUARD

Where subject to mechanical damage a heat detector shall be protected by an approved UL/FM mechanical guard as shown in the image on the left.

GAS DETECOR

10.5.5 NATURAL GAS DETECTOR

A gas detector is a device which detects the presence of various gases within an area, usually as part of a safety system. This type of equipment is used to detect a gas leak and interface with a control system as a process to facilitate proper protocol (20% LEL = audible alarm, and 50% LEL = initiate a plant shut-down). When activated, these detectors will emit audible and visible alarms in the control room.

10.6 SIGNALS INITIATING DEVICES GENERATE

TYPE OF DEVICE	ACTIVATED BY	TYPE OF SIGNAL	ACTION NORMALLY REQUIRED TO RETURN DEVICE TO "NORMAL" CONDITION
Manual pull station	Manually pulling handle, may be single action and double action pull station	Fire Alarm	Return handle to normal position. A key or other method may be required to reset the station to a normal condition.
Smoke, beam, and duct detectors	Detection of particles of combustion	Fire Alarm	Smoke detectors will normally reset when the reset button is pressed at the FACP if the condition activating the detector has been cleared.
UV/IR detectors	UV or IR rays	Fire Alarm	Once the detector is cleared, the COF holder will manually reset the panel switch responsible for that detector. Consideration should be given to false signals from the sun reflecting off of metallic objects. Trouble signals will be transmitted when the lens is obstructed by snow/ice/rain. The trouble alarm should be "non latching" so that the alarm will go away once the condition is clear. For most sensors, the heat from the detector is sufficient to clear any condensation on the lens.
Heat detectors	Abnormally high temperature (fixed temperature detector) or rapid temperature rise(rate of rise detector)	Fire Alarm	After activation most Fixed temperature heat detectors will not self-restore and will require replacement by a qualified service technician. Rate of rise detectors will normally self-restore after activation.
Natural gas detectors	Methane level	Supervisory Signal	Natural gas detector will normally reset at control panel if the condition activity by the detector has been cleared.
Oxygen Detectors	Minimum allowable level of oxygen	Supervisory Signal	System automatically shuts-off at the predetermined level.

NOTE: There are other circumstances which will cause initiating device to signal an alarm condition, creating false alarms and causing unnecessary Fire Department responses. Care must be taken at all times to protect all detectors from transmitting false alarms. Smoke detectors which have not been properly cleaned and maintained will also create false alarms. Proper maintenance on initiating devices should be followed at all times.

ALL ABNORMAL CONDITIONS MUST BE INVESTIGATED AND NOTED IN THE LOG BOOK.

11. FIRE PROTECTION

There are instances when fire protection equipment is not fully operational. This may occur with the part(s) of fire protection systems need to be inspected or tested or simply when they are malfunctioning and in a need of repair. During those times proper fire watch and fire guard needs to be conducted as listed in this study material.

The following section covers the minimum equipment and procedures required to control, extinguish and minimize the effects of fires and leaks or spills of LNG. Operational tests of all fire protection systems shall be made in the presence of a representative of the Fire Department.

11.1 BASIC EQUIPMENT

a. Yard hydrant systems
b. Water sprinkler and deluge systems
c. Dry chemical systems
    - Dry chemical truck
d. Foam systems where required
e. Special extinguishing systems where required
f. Alarm systems for detecting combustible gas and fires and means for notifying the Fire Department
g. Emergency shutdown as described in Fire Rules section 23-03(q)(7)
h. A trained fire brigade
i. A training manual and pre-fire plan
j. Control of ignition sources
k. Fire Boat Connection(s)

11.1.1 YARD HYDRANT SYSTEM

Every LNG plant shall be protected by a system of yard hydrants with hose provided throughout. Hydrants shall be fed from a minimum 10" looped main. Monitor nozzles shall be located as required by the Fire Department. Systems shall be wet, maintained at a pressure not less than 50 psig at all times, and capable of being raised by the plant fire pumps to a greater operating pressure of at least 125 psig or other pressures designated by the Fire Department.

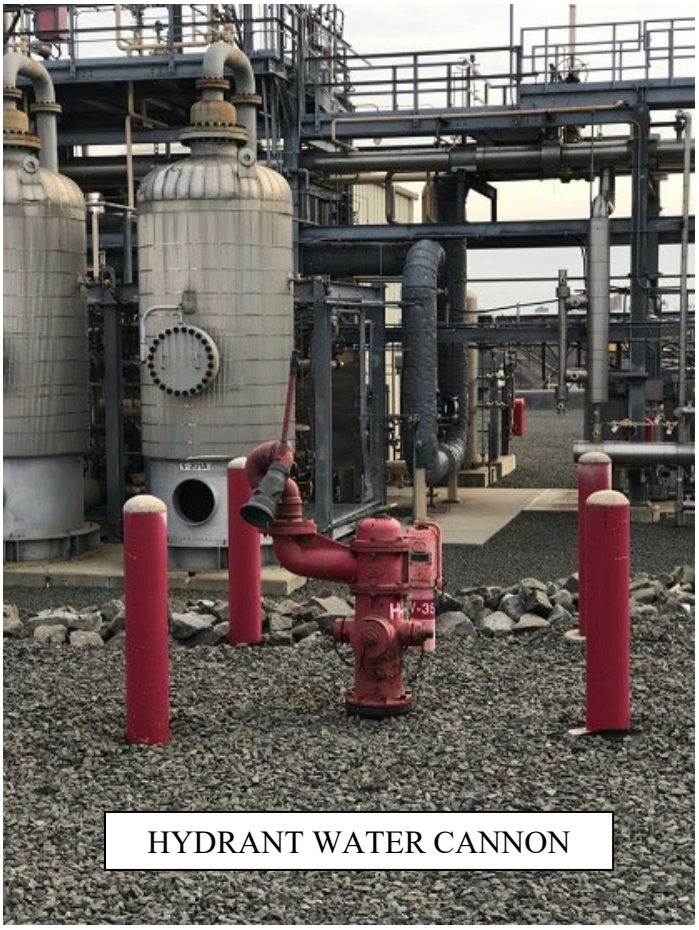
- Hydrants shall be of the "New York City" type with two 2.5" Fire Department male threaded outlets with hydrant spacing according to the Administrative Code, except that hydrants and mains shall not be placed within impounding areas.
- Where the water supply is from salt water, no connection to a city water main is permitted.
- Fire Pump shall be installed in a water pump house (if equipped) and shall be of sufficient capacity to supply all anticipated needs of the water systems required by the Fire Department.

- At least two fire pumps having alternate power sources, one of which shall be electrical, shall be provided.
- The fire pump house shall be of in and/or non-combustible construction and protected by an outside deluge system designed to maintain the interior temperature at a level no higher than can be endured safely by a pump operator and the pumping and electrical equipment.

When the hydrant supply is salt water, the salt water supply shall be taken from coffer dams and inlets thereto protected by non-corrodible mesh screen capable of screening out all debris over ½" in cross-section. Such screen shall be removable for cleaning.

Adjacent to the salt water pump house, a drafting site shall be maintained for the use of the largest Fire Department pumper. Such site shall be built according to the requirements of the Fire Department. Suction connections shall be 12" plain for super-pumper use and 4.5" male Fire Department threaded for regular land engines.

A manifold shall be installed at the drafting site whereby the Fire Department may augment the yard salt water hydrant system by a land engine and the fire boat connection.


HYDRANT WATER CANNON

11.1.2 LAND ENGINE FACILITIES

At least two Fire Department connections, with Fire Department threads, each having two or more 3" female swivel inlets with New York Fire Department threads, shall be provided for use by land engines for any yard hydrant system fed by City water. Owing to variable site conditions the proposed location of these Fire Department connections shall be submitted to the Fire Department for approval.

11.1.3 WATER SPRINKLER AND DELUGE SYSTEMS

Based on radiation studies noted in Fire Department Rule 23-03(c)(1) which says: exterior sprinkler systems shall be provided for buildings which could become

untenable or where equipment could be damaged or rendered inoperable in event of a major LNG fire, e.g.: control house, compressor, fire pump house, fireboat connection, drafting site, and any building or location normally occupied or which requires personnel to be at their posts in emergencies.

- Each system shall operate automatically on fire detection anywhere in the plant when the ambient temperature on the outer face of the building reaches 135 degrees F. Each system shall be capable of remote manual operation.
- Operational and hydrostatic tests (at 200 psi) of all sprinkler, and deluge system shall be witnessed by a representative of the Fire Department before acceptance.
- Buildings in which combustibles or flammables are stored, including warehouses and garages, shall be protected by an interior sprinkler system, when within 500 ft. of any LNG storage or process equipment.

11.1.4 LNG CONTAINER DELUGE SYSTEM

LNG container or tank shall be required to be bermed and shall be protected by a water deluge system completely encircling the roof at the top of the berm. This system shall have a two-fold purpose:

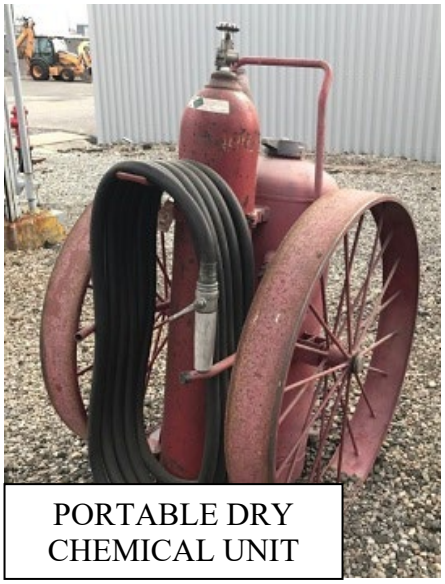
(a) To reduce the effect of radiated heat to exposures in the event of fire in the tank.
(b) To reduce the effect of radiated heat from another tank or tanks in a complex.

11.1.5 DRY CHEMICAL FIRE EXTINGUISHING SYSTEM

Dry chemical system is a non-water form of fire extinguishing system. It is commonly installed in flammable liquid and gas storage and processing areas.

DRY POWDER UNIT WITH ISOLATING VALVES

At least once a month, an inspection shall be conducted by a trained and knowledgeable person to assess that the system is in good working order. A licensed master fire suppression piping contractor properly trained and having knowledge of the installation, operation and maintenance of the wet and dry chemical fire extinguishing system shall inspect, test, service and otherwise maintain such system in accordance with this section and the manufacturer's specifications and servicing manuals at least on a semiannual basis. Tests shall include a check of the detection system, alarms and releasing devices, including manual stations and other associated equipment. Extinguishing agent containers shall be checked to verify that the system has not been discharged. Stored pressure-type units shall be checked for the required pressure. The cartridge of cartridge-operated units shall be weighed and replaced at intervals specified by the manufacturer.



PORTABLE DRY CHEMICAL UNIT

11.1.6 FIRE EXTINGUISHERS

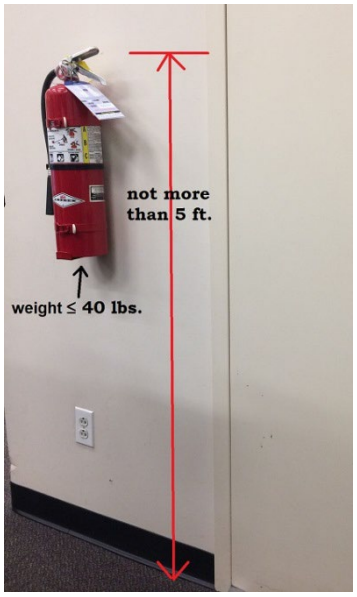
C-01 Certificate of Fitness holders must be familiar with the different types of fire extinguishers that are present at their plants. They must know how to operate the extinguishers in a safe and efficient manner, as well as the difference between various types of extinguishers and when they should be used.

INSTALLATION AND PLACEMENT

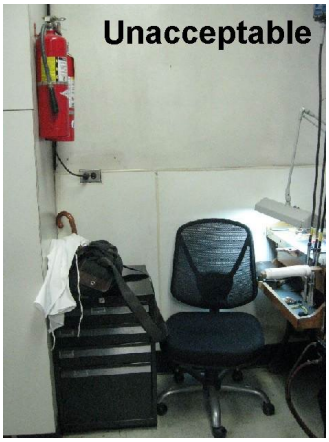
Fire extinguishers must be located in conspicuous locations where they will be readily accessible and immediately available for use. These locations must be along normal paths of travel. Fire extinguishers having a gross weight 40 pounds or less must be installed so that the top of the extinguisher is not more than 5 ft above the floor. Hand-held fire extinguishers having a gross weight exceeding 40 pounds shall be installed so that their tops are not more than 3.5 feet above the floor. The clearance between the floor and the bottom of installed hand-held extinguishers shall not be less than 4 inches.

IN OTHER WORDS, NO FIRE EXTINGUISHER IS ALLOWED TO BE ON THE FLOOR.

FIRE EXTINGUISHER (IN THE PROCESS AREA)



Fire extinguishers must be located in conspicuous locations where they will be readily accessible and immediately available for use. These locations must be along normal paths of travel.



(1) For the fire extinguisher having 40 pounds or less, its top must not be more than 5 ft. above the floor

(2) The fire extinguishers must be accessible and unobstructed.

(1) The bottom of the fire extinguisher must be at least 4 in. above the floor.

(2) The fire extinguisher must be properly mounted.

Minimum sizes of fire extinguishers for a Class B hazard shall be provided in accordance with the information below:

Fire Extinguisher Size and Placement for Class B Hazards		
Type of Hazard	**Basic Minimum Extinguisher Rating**	**Maximum Travel Distance to Extinguishers (ft)**
LIGHT (LOW)	5-B	30
	10-B	50
ORDINARY (MODERATE)	10-B	30
	20-B	50
EXTRA (HIGH)	40-B	30
	80-B	50

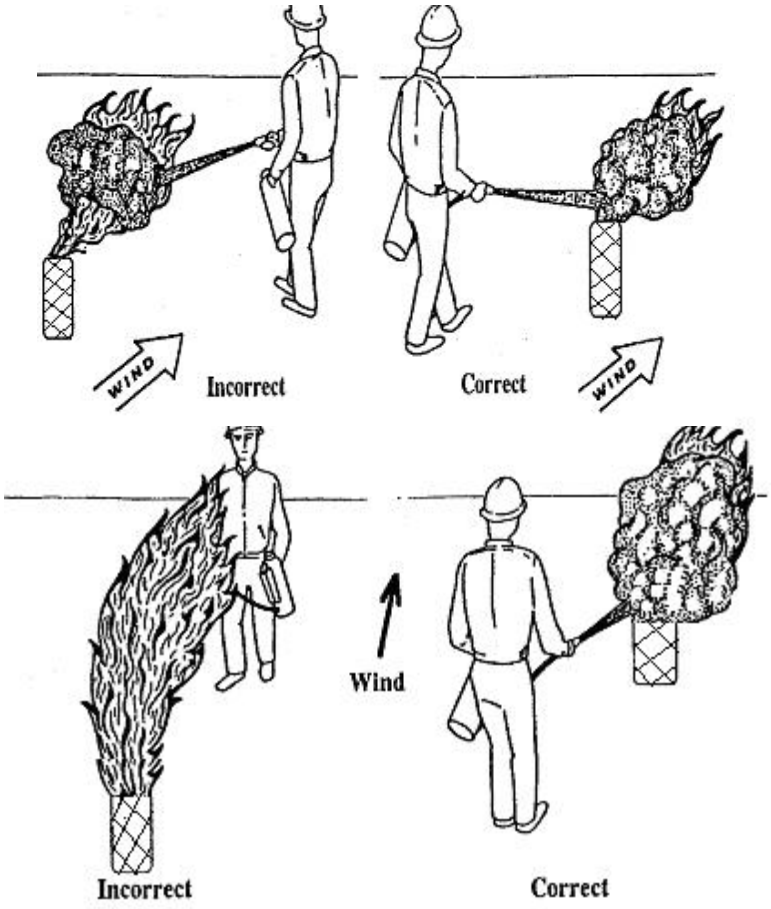
In the event that a fire extinguisher has been discharged, a fully charged replacement is required before work can resume. Portable fire extinguishers are important in preventing a incipient fire from growing into a catastrophic fire; however, they are not intended to fight large or spreading fires. By the time the fire has spread, fire extinguishers, even if used properly, will not be adequate to extinguish the fire. Such fires should be extinguished only by the building fire extinguishing systems or trained firefighters.

In case of any fire, **911 MUST** be called. Fire extinguishers must be used in accordance with the instructions painted on the side of the extinguisher. They clearly describe how to use the extinguisher in case

of an emergency. The Certificate of Fitness holder should be familiar with the use of portable fire extinguishers. When it comes to using a fire-extinguisher just remember the acronym **P.A.S.S**. to help ensure you use it properly.
P.A.S.S. stands for Pull, Aim, Squeeze, Sweep. An example of these instructions is depicted in the image on the previous page.

OPERATING INSTRUCTIONS FOR A FIRE EXTINGUISHER
The easiest way to extinguish the fire is to shut off the source by using the emergency-shut-off valve until the flame is extinguished. The flame must be approached from an upwind direction. This will prevent the Certificate of Fitness holder from being burned by the flames. Never approach a fire from a downwind direction.

The dry chemical stream must be directed toward the point where the flame begins. Do not direct the chemical stream at the center of the flame. This will not extinguish the fire.



In relation to a fire on piped gas, Certificate of Fitness holder must follow important steps:
1) activate the alarm
2) try to shut-off gas supply
3) call 911

This is safer than allowing the flammable gas to leak out. A flammable gas leak could result in a serious explosion if it were ignited. Never attempt to extinguish the flame unless the gas supply is shut. When it is not possible to shut off the gas supply (e.g. the fire is near the control valve or the shut-off valve), allow the flame to burn itself out while calling 911. In the meantime, the COF holder should try to control the scene and prevent the fire from spreading to the surrounding materials. The Certificate of Fitness holders should only consider extinguishing fires when they are limited in size such that they can readily be extinguished using a portable fire extinguisher. Fire extinguishers, even if used properly, will not be adequate to extinguish the fire by the time the fire has spread. Such fires should only be extinguished by the building fire extinguishing systems or trained firefighters only.

TYPES OF FIRE EXTINGUISHERS

A description of the four classes of fires and the appropriate extinguishers are described below.

Class A fires are caused by ordinary combustible materials (such as wood, paper, and cloth). To extinguish a Class A fire, extinguishers must utilize either the heat-absorbing effects of water or the coating effects of certain dry chemicals.

Class B fires are caused by flammable or combustible liquids and gases such as oil, gasoline, etc. To extinguish a Class B fire, the blanketing-smothering effect of oxygen-excluding media such as CO2, dry chemical or foam is most effective.

Class C fires involve live electrical equipment. These fires must be fought with fire extinguishers that do not conduct electricity. Foam and water type extinguishers must not be used to extinguish electrical fires. After the power has been isolated from the electrical equipment, extinguishers for Class A or B fires may be used.

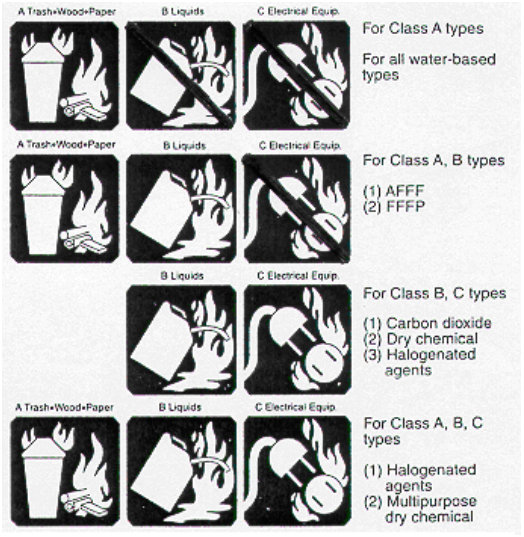
Class D fires are caused by ignitable metals, such as magnesium, titanium, and metallic sodium, or metals that are combustible under certain conditions, such as calcium, zinc, and aluminum. Generally, water should not be used to extinguish these fires.

A multi-purpose dry chemical fire extinguisher may be used to extinguish more than 2 Classes fires. Examples of some fire extinguishers are shown below.

EXAMPLES OF FIRE EXTINGUISHERS

10-B:C (10BC)	3-A:40-B:C(3A40BC)
	

Symbols may also be painted on the extinguisher. The symbols indicate what kind of fires the extinguisher may be used upon. Examples of these symbols are shown on the next page.



CLASSES OF FIRES	TYPES OF FIRES	PICTURE SYMBOL
A	Wood, paper, cloth, trash & other ordinary materials.	
B	Gasoline, oil, paint and other flammable liquids.	
C	May be used on fires involving live electrical equipment without danger to the operator.	
D	Combustible metals and combustible metal alloys.	D

FIRE EXTINGUISHER IDENTIFICATION SYMBOLS

The symbol with the shaded background and the slash indicates when the extinguisher must not be used. The Certificate of Fitness holder must understand these symbols. All fire extinguishers should be kept in good working order at all times.

PORTABLE FIRE EXTINGUISHER INSPECTIONS

MONTHLY

The portable fire extinguishers are required to be checked monthly. The owner of the business is responsible to select a person to do a monthly inspection. This monthly inspection is called a "quick check".

The **QUICK CHECK** should check if:
(1) the fire extinguisher is fully charged;
(2) it is in its designated place;
(3) it has not been actuated or tampered with;
(4) there is no obvious or physical damage or condition to prevent its operation.

The information of the monthly inspection record must include the date of the inspection, the name/initials of the person who did the inspection. This monthly quick check is documented on the back of the PFE tag or by an approved electronic method that provides a permanent record.

ANNUALLY

At least annually all Portable Fire Extinguishers must be checked by a W-96 Certificate of Fitness holder from FDNY approved company. After each annual inspection W-96 COF holder will replace the PFE tag. The information of the annual inspection record must be indicated on the new PFE tag.

FREQUENCY

1. Fire extinguishers shall be manually inspected when initially placed in service.
2. They shall be inspected either manually or by electronic means at a minimum of once a month.
3. Fire extinguishers should be visually inspected more often especially where any of the following conditions exist:

- High frequency of fires in the past
- Severe hazards
- Locations that make fire extinguishers susceptible to mechanical injury or physical damage
- Exposure to abnormal temperatures or corrosive atmospheres

When an inspection of any fire extinguisher reveals a deficiency in any of the conditions listed above, immediate corrective action shall be taken.

PORTABLE FIRE EXTINGUISHER (PFE) TAGS

Installed portable fire extinguishers must have an FDNY standard PFE tag affixed. This tag will have important information about the extinguisher. By November 15, 2019, all portable fire extinguishers must have the new PFE tags. The FDNY will only recognize new PFE tags and will be issuing violations to business that have PFE installed without a proper tag.

The color of the fire extinguishers may be changed by the FDNY every few years. The FDNY recommends two ways to verify the tag's legitimacy:

1. Hologram:

A real hologram strip shown on the tag is 3 inches long by ¼ inch wide. Counterfeit tags will NOT have a high quality silver hologram. The hologram on a counterfeit tag will NOT change color as it is moved against the light.

2. QR code

IF you scan the QR code, it should direct you to the updated FDNY approved fire extinguisher company list. You can use the company list to verify if the company printed on the list is currently approved by the FDNY.

If your PFE tags cannot be verified via these two methods, contact your supervisor. If you suspect your PFE is a counterfeit, contact FDNY immediately by e-mail: Tags.Decal@fdny.nyc.gov

PFE tag (This tag is released for 2021-2023)

FIRE EXTINGUISHER INSPECTION RECORD KEEPING

During the inspection the designated C-01 Certificate of Fitness holder should date and initial the tag. Where manual inspections are conducted, records for manual inspections shall be kept on a tag or label attached to the fire extinguisher, on an inspection checklist maintained on file, or by an electronic method. Records shall be kept to demonstrate inspections have been performed in each of the last 12 months.

All fire extinguishers must be serviced and recharged annually by a FDNY approved company and a W-96 (Full Service Shop of Portable Fire Extinguisher) Certificate of Fitness holder. (A dry chemical fire extinguisher needs to be recharged when the gauge needle points to the red area.)

12. EMERGENCY PROCEDURES

Each COF holder shall determine types and places of emergencies, other than fires, that may occur at the plant. These emergencies may happen because of operating malfunctions, structural collapse, personnel error, forces of nature, and activities adjacent to the plant.

EMERGENCY ESCAPE TURNSTYLE

To adequately handle each type of emergency the C-01 Certificate of Fitness holder must follow procedures listed in manual of operations. The procedures must provide for the following:

(1) Responding to controllable emergencies, including notifying personnel and using equipment appropriate for handling the emergency.

(2) Recognizing an uncontrollable emergency and taking action to minimize harm to the public and personnel, including prompt notification of appropriate local officials of the emergency and possible need for evacuation of the public in the vicinity of the LNG plant.

(3) Coordinating with appropriate local officials in preparation of an emergency evacuation plan, which sets forth the steps required to protect the public in the event of an emergency, including catastrophic failure of an LNG storage tank.

(4) Cooperating with appropriate local officials in evacuations and emergencies requiring mutual assistance and keeping these officials advised of:

- The LNG plant fire control equipment, its location, and quantity of units located throughout the plant;

- Potential hazards at the plant, including fires;
- Communication and emergency control capabilities at the LNG plant; and
- The status of each emergency.

IN CASE OF ANY INCIDENT THE C-01 CERTIFICATE OF FITNESS HOLDER IS RESPONSIBLE FOR:
Step 1. Notifying the manager.
Step 2. Contacting the Fire Department immediately.
Step 3: Notifying other agencies as required by the federal rules and regulations.

The Certificate of Fitness holder may need to initiate an orderly evacuation when required by the hazard presented and follow plant procedures. The Certificate of Fitness holder must answer any questions asked by firefighters when they arrive. For example, he or she must indicate the location of the fire, describe the type of fire protection devices available and describe the materials stored in surrounding areas. The Bureau of Fire Prevention may require a detailed report on the causes and the consequences of the explosion or fire. Generally, this report must be filed as soon as practicable after the incident.

12.1 SHUT-DOWN

Instrumentation for liquefaction, storage and vaporization facilities shall be designed so that in the event of failure or instrument air failure the system will go into a "failsafe" condition until the system can be reactivated or secured.

Provision shall be made for automatic shut-down of major items of equipment, manually from several locations remote from the equipment and accessible in an emergency, and automatically in the event of fire detection or a major leak. In addition to the fire detection, the emergency shut-down shall include automatic activation of the fire extinguishing system in the area of detection, and shall include automatic notification to the Fire Department via an FDNY approved central station. The emergency shut-down shall be accompanied by audible and visible alarm signal at the control house and sounding of the plant alarm.

12.2 PERSONNEL SAFETY

(a) Each C-01 Certificate of Fitness holder shall provide any special protective clothing and equipment necessary for the safety of personnel while they are performing emergency response duties.
(b) All personnel who are normally on duty at a fixed location, such as a building or yard, where they could be harmed by thermal radiation from a burning pool of impounded liquid, must be provided a means of protection at that location from the harmful effects of thermal radiation or a means of escape.
(c) Each LNG plant must be equipped with suitable first-aid material, the location of which is clearly marked and readily available to personnel.

13. RECORD KEEPING, INSPECTIONS AND TESTS

A record of all tests, inspections, and other operations of the fire alarm system must be noted in the log book. Log books can be combined or separated depending upon a plant's in house procedures.

ONLY CERTIFIED TECHNICIANS HOLDING S-97 (Certificate of Fitness for Fire Alarm Systems Inspection, Testing and Service Principal) OR S-98 (Certificate of Fitness for Fire Alarm Systems Inspection, Testing and Service Technician) CERTIFICATES OF FITNESS ARE AUTHORIZED TO PERFORM MAINTENANCE AND TESTING ON THE FIRE ALARM SYSTEMS.

13.1 RECORDKEEPING (Fire Code section 107.7)

A written record of the inspections, tests, servicing, fire watch and other operations and maintenance required by NYC Fire Rules, NYC Fire Code, referenced standards and any other required recordkeeping referenced therein, shall be maintained on the premises or other approved location for a minimum of 3 years. The commissioner may prescribe the form and format of such recordkeeping. Such records shall be made available for inspection by any Fire Department representative, and a copy of such records shall be provided to the Fire Department upon request. The Fire Department additionally may require that certain records be filed with the Fire Department. Electronic filings may be made in lieu of paper filings, when approved.

13.2 ALARM LOG BOOK

(1) The provisions of this section shall apply to any premises having a defined fire alarm system.
(2) A person designated by the owner, shall be responsible to make all log book entries.
(3) An alarm log book shall be maintained on the premises, at the building's main fire alarm control panel. In the absence of a secure location at the main fire alarm control panel, the alarm log book may be secured during non-business hours in another area provided it is made available for inspection by any Fire Department representatives responding to an alarm on the premises. Alarm log book entries shall be made in chronological order, recording the location and causes of all alarm signals transmitted by such fire alarm system.
(4) The alarm log book shall be a bound book (other than spiral bound) with consecutively numbered and lined pages. The cover of the log book shall bear the inscription, "ALARM LOG BOOK", together with the name and address of the plant. All entries shall be made in ink and dated. A separate log book shall be kept for each calendar year. Log books shall be retained for a period of three (3) years from the date of the last entry.
(5) The alarm log book shall be divided into three (3) separate sections as set forth on the subsequent page. Each section shall have a sufficient number of pages

to allow for entries for at least one (1) year. The following log book entries are required and shall be made in each instance:

(A) DAILY ENTRIES
The name of the person who made the entry, the certificate of fitness number of the fire safety director on duty, if applicable, and the time each tour of duty began and ended, shall be entered in the alarm log book on a daily basis. These entries shall be set forth in columns in the log book as follows:

(1) name
(2) Certificate of Fitness number
(3) time started
(4) time relieved

(B) SYSTEM OFF-LINE ENTRIES
The date and time the alarm system was taken off-line, the reason for such action, the name and Certificate of Fitness number of the person notified at the central station (or other evidence of notification satisfactory to the Department), and the date and time the system was restored to service, shall be entered in the alarm log book in each such circumstance. These entries shall be set forth in columns in the log book as follows:

(1) time off line
(2) reason off line
(3) central station name and telephone number
(4) time restored

(C) ACTIVATED ALARM ENTRIES
The date and time the alarm activated, the type and location of the device (e.g., smoke detector, main entrance to the control room), the probable cause of the alarm, and the Fire Department unit and officer responding shall be entered in the alarm log book in each such circumstance. These entries shall be set forth in columns in the log book
as follows:

(1) date and time activated
(2) location and detector type
(3) probable cause
(4) FDNY unit and officer

13.3 SMOKE DETECTOR MAINTENANCE RECORDKEEPING

(A) A smoke detector maintenance log book shall be maintained on the premises in the office of the fire safety director, or, in buildings not requiring a fire safety director, in the building superintendent's office.
Such log book shall state the:

1. total number of smoke detectors on the premises
2. list each smoke detector by location.

Entries shall be made in such log book, in chronological order, regarding the installation, repair, maintenance and testing of the smoke detectors, and any signals transmitted by such detectors.
Such entries shall include:

1. The date and nature of any inspection,
2. Cleaning,
3. Testing,
4. Calibration,
5. The name of the person,
6. The name of the company performing such work,
7. Any signal transmitted by analog (intelligent) smoke detectors communicating a need for cleaning and/or adjustment.

(B) The C-01 Certificate of Fitness holder shall be responsible to make all smoke detector maintenance log book entries.

(C) The smoke detector maintenance log book shall be a bound book (other than spiral bound) with consecutively numbered and lined pages. The cover of the log book shall bear the inscription, "SMOKE DETECTOR MAINTENANCE LOG BOOK," together with the name and address of the occupancy.

All entries shall be made in ink and dated. A separate log book shall be kept for each calendar year. Log books shall be retained for a period of three (3) years from the date of the last entry. A computer record that is designed to prevent or detect alteration of information and that is otherwise maintained in a manner acceptable to the Fire Department, may be maintained in lieu of a bound log book provided that such a computerized record is available on the premises for inspection by any Department representative during business hours.

(D) A copy of the smoke detector manufacturer's recommended maintenance procedures shall be kept with the smoke detector maintenance log book.

13.4 TESTING OF DEVICES

Any time a fire alarm system is to be activated during a test, inspection, or fire drill, ***it is mandatory to take the system "off line" by notifying the FDNY approved central station company monitoring the fire alarm beforehand to prevent the unnecessary dispatching of the Fire Department***. It is not necessary to take the system offline when the speaker audibility tests are being conducted.

13.5 MANUAL (PULL) STATION

Each fire alarm system manual pull station should be tested at a minimum of once monthly where practical. The results of the test shall be recorded in the log book. Defective devices must be replaced immediately by qualified personnel. The manual stations may also be used to conduct fire drills. Based on the New York

City Fire Code, manual fire alarm boxes must be red in color.

13.6 SMOKE DETECTORS

Smoke detectors must be:

(1) cleaned not less than once every six (6) months, except for analog (intelligent) smoke detectors, which shall be cleaned no later than one (1) week from receipt of an indication of the need for cleaning.
(2) tested for smoke entry not less than once a year.

This procedure ensures that the detector is kept in good working condition. Smoke detectors must be cleaned by a person holding a proper Certificate of Fitness for cleaning smoke detectors (S-78/F-78). The FDNY website provides a monthly list of approved Smoke Detector maintenance companies on the FDNY website @
http://www1.nyc.gov/assets/fdny/downloads/pdf/business/approved-companies-smoke-detectors.pdf

The C-01 Certificate of Fitness holders are not allowed to perform the smoke detector cleaning. The smoke detectors are extremely sensitive and easily damaged. They should never be painted or altered in any way. If the C-01 COF holder comes across a painted smoke detector, they should immediately make a log entry and arrange replacement of the device by a qualified technician. All testing shall be consistent with manufacturer specifications. Appliances shall be mounted independently of their attachments to the circuit conductors.

13.7 HEAT DETECTORS

Heat detectors can only be tested by authorized fire alarm technicians. C of F holders are responsible for ensuring that operational heat detectors are in place. They must notify fire alarm maintenance companies to make all necessary repairs.

13.8 UV DETECTOR / IR SENSOR

If the UV detectors are found to be malfunctioning the Certificate of Fitness holders must get in touch with a company that services them and schedule a repair. All maintenance and repairs of fire alarm systems and related components shall be performed by certified personnel in the inspection, testing, and maintenance of fire alarm systems as per NYC Building and Fire Codes.

13.9 CENTRAL STATION

The telephone number for the FDNY approved central station should be readily available to the C-01 Certificate of Fitness holder. The telephone number for the FDNY approved central station and the account number associated with the fire alarm system are required to be located on the FACP and central station transmitter.

13.10 LNG SYSTEM INSPECTIONS AND TESTS

13.10.1 GENERAL

Inspections and tests shall be made by the C-01 Certificate of Fitness holder and in the presence of and witnessed by the representatives of the NYC Fire Department. Operational re-tests of fire protection systems shall be made annually and witnessed by a representative of the Fire Department. Each C-01 Certificate of Fitness holder must periodically determine whether inspectors performing construction, installation, and testing duties required by this part are satisfactorily performing their assigned functions.

13.10.2 INSPECTING LNG STORAGE TANKS

Each LNG storage tank must be inspected or tested to verify that each of the following conditions does not impair the structural integrity or safety of the tank:

(a) Foundation and tank movement during normal operation and after a major meteorological or geophysical disturbance.
(b) Inner tank leakage.
(c) Effectiveness of insulation.
(d) Frost heave.

13.10.3 TESTING OF PROCESS PIPING

Pressure tests shall be made of all piping in accordance with Fire Rule 23-03(s). Carbon and low alloy steel piping shall not be pressure tested at metal temperatures below 35 degrees Fahrenheit.

Such tests shall be made in the presence of a representative of the Fire Department and the written results thereof promptly filed with the Fire Department.

Records of such tests shall include clear identification of the piping, pressure, test medium, temperature thereof, ambient temperature, duration and shall remain a permanent record.

OTHER LNG FACILITY TESTS	
PRESSURE RELIEF VALVES	Every 12 months, but not to exceed every 15 months.
PROCESS EQUIPTMENT HYDROSTATIC TEST	Every 5 years.
FIRE SUPPRESSION SYSTEMS (underground water hydrant system, including Fire Department Connections)	Every 5 years.
DELUGE SYSTEMS FLOW TEST	Annually
WATER CURTAIN FLOW TEST	Annually
PERFORMANCE OF DRY POWDER SYSTEMS TEST	Annually
EMERGENCY SHUTDOWN AND DEPRESSURIZATION TEST	Annually
FIRE PUMPS FLOW TEST	Annually
FIRE HYDRANT FLOW TEST	Annually

All on-site tests shall be witnessed by a representative of the Fire Department and test charts, and affidavits must be submitted to the Fire Department.

14. FIRE GUARD FOR IMPAIRMENT

This section outlines New York City Fire Department (FDNY) guidelines for fire guard performing a fire watch. This happens when a required fire protection system is out-of-service. Fire guards are required to inspect the areas in which the fire protection systems are out of service.

14.1 INTRODUCTION

Where a required fire protection system is out of service, a fire watch shall be provided. Fire watch at an LNG plant can be provided by one or more persons holding C-01 Certificate of Fitness for fire guard. The fire guard(s) is/are required to be immediately available when the system is out-of-service with the following exception:

- For the initial 4 hours of an unplanned and planned out of service condition, the impairment coordinator or a trained and knowledgeable person who is capable of performing fire watch duties and is designated by the LNG plant management may perform the duties of the fire watch.

The impairment coordinator or a trained and knowledgeable person, designated by the LNG management, should begin conducting a fire watch in the area where the fire protection systems are out-of-service. After 4 hours of an out of service condition, such patrols shall only be conducted by a C-01 Certificate of Fitness holder.

A fire guard should be available to patrol all areas in which the fire protection system is out of service at least once every hour.

The fire guard duties should be on a 24 hours a day basis. Duties should continue until the systems are restored to good working order. In some cases, Fire Department representatives may be on scene to give directions, such as the number of required fire guards or other fire protection measures that may be required.

The person performing fire guard duties for impairment is recommended to be familiar with the types of fire safety evacuation plans for the LNG plant where they provide fire watch. They should also be familiar with the associated staff available to implement the fire plan. The fire guard must be aware of his/her obligations for notifying the Fire Department in the event of fire (**FC Chapter 4 Section 401.3**). Further information is available at:

- Emergency Planning and Preparedness: **[FC Chapter 4 Section 401.3 and Section 408]**
- Fire Protection System: **[FC Chapter 9 Section 901 and Section 906]**

14.2 REQUIREMENTS AND DUTIES

Fire guards are required to reduce the threat of fires in a variety of locations. They are trained in and responsible for maintaining a fire watch. Fire guards must have a general knowledge of **portable fire extinguishers and/or alarm pull stations**.

An impaired fire protection system presents hazards since detection, notification and/or extinguishing systems are not working. Individuals and premises cannot depend on impaired fire protection systems to protect them.

The C-01 Certificate of Fitness authorizes an individual to act as an impairment fire guard to maintain fire watch responsibilities. Before starting to patrol the affected area, the fire guard should have enough knowledge to identify:

(1) the entry/egress routes to/from the affected area;
(2) the extent of the out-of-service condition;
(3) the location of hazardous materials that are stored, handled or used on the premises;
(4) the location of portable fire extinguishers;
(5) the means available for the fire guard to make required notification.

The fire guard should pay attention to the affected area where hazardous materials are stored, handled or used.

The fire guard should evaluate the risk of the impairment situation. The risk may be affected by the following:

(1) hazard level of the materials;
(2) amount of the hazardous materials;
(3) number of occupants in the affected area;
(4) LNG personnel/visitors familiarity of the premises;
(5) number of impaired fire protection systems in the LNG plant.

14.3 FIRE GUARD PATROLS

LNG plant with out-of-service fire protection system should be constantly checked. Every area of the premises should be checked at least once every hour.

PERSON PERFORMING THE FIRE GUARD DUTIES SHALL NOT BE GIVEN ANY OTHER RESPONSIBILITIES. THE FIRE GUARD SHALL INSPECT FOR SMOKE AND FIRE, AND IF FOUND IMMEDIATELY CONTACT THE FIRE DEPARTMENT.

During the checks of the area, the fire guards should make sure there is no smoke and fire. This person should also ensure that egress routes, fire extinguishers, and fire alarm pull stations are available. If any problem is found, the fire guard must report it to LNG plant management or the responsible person

in charge immediately. The designated person will then make plans to have the defects corrected.

The inspections may differ from one LNG plant location to another; however, the following general inspection rules apply for all locations:

(a) **Inspect all exits to determine condition and availability for use.** All exits must be kept free of blockage. Blocking the exit may prevent personnel/visitors from leaving the area. Corrections must be made for proper way of exit with doors opening in direction of travel.

(b) **Check all the doors in the affected areas to see operation conditions and availability for use.**

(c) **Ensure that self-closing doors are not blocked and closed at all times (when not in use).**

(d) **Ensure that exits are properly labeled, and hallways and stairways, are lit.** Emergency lighting shall be provided for exits. Directional signs shall clearly show the path to exit. Exit signs posted above doors and emergency lighting must be lit.

(e) **The entire location must be checked daily for ignition sources.** Any likely ignition sources that are found must be immediately fixed.

(f) **Smoking is prohibited.** The fire guard must enforce the no smoking rules in the area.

(g) **Constantly inspect premises for buildup of rubbish.** Trash and garbage must not to be allowed to accumulate inside the premises. Accumulated trash is a fire hazard. It may be easily ignited by a stray spark. All trash and garbage must be removed from the premises regularly.

(h) **Know the location and correct use of fire extinguishers, and fire alarm pull stations.** All fire extinguishers and pull stations must be clearly visible. The fire guard must know how to use fire alarm pull station and the fire extinguishers. Fire alarm pull station should be activated in case of fire emergency only.

(i) **"Hot work" operation may be prohibited**. The fire guard must know that no "hot work" operation is allowed in areas of an LNG plant where the sprinkler system is impaired. At a construction site, no "hot work" operation is allowed if the sprinkler system or the standpipe system is impaired.

14.4 INSPECTION RECORD

(Fire Rule901-04(d)(11))

A record shall be kept on the premises, maintained by the assigned person. The record of all fire safety-related activities should be made available for inspection for Fire Department. It should be in writing or marked by an approved electronic device. The record must be maintained for at least 48 hours after the fire watch has finished.

The daily written record must be signed by the fire guard. The following items should be logged:

(a) the number of inspections completed;
(b) defects found;
(c) violations that have been found, and
(d) the date, name, Certificate of Fitness number and signature of the fire guard who conducted the inspections.

14.5 FIRE DEPARTMENT NOTIFICATION AND EMERGENCY PROCEDURES

Fire Department notification for impairment:

The Fire Department shall be notified that a standpipe system, sprinkler system or fire alarm system is out of service, whether by reason of a planned removal from service or an unplanned out-of-service condition.

(1) **Standpipe systems.** Notification shall be made to the Fire Department whenever a standpipe system is or will be out of service for any period of time.
(2) **Sprinkler systems and fire alarm systems.** Notification that a sprinkler system or fire alarm system, or any part thereof, is or will be out of service shall be made to the Fire Department under the following circumstances:

- With respect to a sprinkler system, the work or repairs cannot be completed, and the system restored to service, within 8 hours of the time the system was placed or went out of service; or
- With respect to a fire alarm system, the work or repairs will require the fire alarm system to be out of service for more than 8 hours in any 24-hour period; or
- One or more other fire protection systems in the area in which a fire protection system is out of service are or will also be out of service at the same time.

The borough dispatcher numbers for non-emergency that should be used for notifications are:

Manhattan	(212) 570-4300
Brooklyn	(718) 965-8300
Queens	(718) 476-6200
Bronx	(718) 430-0200
Staten Island	(718) 494-4296

The person making the notification should be able to give the following information:

- the LNG plant contact information;
- the premises address;
- the type of fire protection system that is out of service;
- whether the out-of-service is planned or unplanned;
- if a planned removal from service, the date and time the fire protection system will be placed out of service, and the estimated duration the system will be out of service;
- If an unplanned out-of-service condition, the estimated duration the system will be out of service;
- The floors or areas in which the fire protection system is out of service;
- if the other fire protection systems are in good working order;
- The name and certificate number of the certificate of fitness holder responsible for supervision of the fire protection system that is out of service.

THE C-01 CERTIFICATE OF FITNESS HOLDER SHOULD BE PROVIDED WITH ACCEPTABLE MEANS OF COMMUNICATION TO THE FIRE DEPARTMENT.

14.6 EMERGENCY NOTIFICATION AND PROCEDURES

C-01 Certificate of Fitness holders performing fire guide duties must have a method of connecting to emergency services. They can use their cell phones to make notifications. They should ensure that there is enough battery power to cover their shift. Notifying by phone is the most direct and effective way to notify the Fire Department.

If a C-01 Certificate of Fitness holder becomes aware of a fire, he/she must immediately telephone 911 and report the emergency. There should be no delays in making such notification.

When notifying 911 of a fire or other emergency, the call-taker will need to obtain certain information about the emergency. Obviously the nature of the emergency and address are the most critical pieces of information. The operator may also ask what the nearest cross-street is, and if anyone is in need of medical attention and if so, what are their symptoms. Providing information about which entrance would provide the most direct access to the emergency area would be helpful in getting the emergency response personnel to the area of the emergency as quickly as possible. If certain entrances are obstructed and are not easily accessible by emergency responders, this information should be communicated to the 911 operator. The more information you have available to communicate to the 911 operator, the more efficient they can get the right kind of help to you quickly.

When a C-01 Certificate of Fitness holder contacts 911, in addition to the information mentioned above, they should be prepared to answer other 911 operator questions, which may include:

- The phone number at which the Certificate of Fitness holder can be reached at;
- The nature of the emergency;
- Details about the emergency, such as a physical description of a person who may have committed a crime, a description of any fire that may be burning, or a description of injuries or symptoms being experienced by a person having a medical emergency.

C-01 holder should be prepared to follow any instructions the operator may provide.

In case of a fire emergency, personnel/visitors may have to be evacuated. If the fire guard is responsible for helping in the evacuation, they should be calm and in control of the situation. A Fire Guard should speak in a clear manner when helping with the evacuation. Their instructions and actions play an important role in controlling panic in an emergency. Personnel/visitors should be told to be calm and move quickly to the closest exit. The Fire Guard should tell the personnel/visitors to avoid the elevators and direct them to use stairwells to exit.

After the FDNY arrives, the Fire Guard should be sure to meet the emergency responders to provide them with information regarding the nature of the emergency, its location in the LNG plant and to provide the information that the emergency responders request.

APPENDIX A

CHAPTER 9 FIRE PROTECTION SYSTEMS

SECTION FC 901
GENERAL

901.1 Scope. This chapter shall govern the design, installation, operation and maintenance, including inspection and testing, of fire protection devices, equipment and systems, and other fire protection measures for the control and extinguishment of fire.

901.1.1 General. Fire protection systems shall be designed, installed, operated and maintained in accordance with this chapter and the reference standards set forth in Table 901.6.

901.2 Design and installation documents. The commissioner may require design and installation documents and calculations to be submitted for review for all fire protection systems. Design and installation documents required or regulated by this code or the rules shall be submitted for review and approval prior to installation, and shall certify that the design complies with the requirements of this code and the rules.

901.3 Permits. Permits shall be required as set forth in Section 105.6.

901.4 Design and installation. Fire protection systems shall be designed and installed in accordance with Sections 901.4.1 through 901.4.5.

901.4.1 Required fire protection systems. Fire protection systems shall be designed and installed in accordance with the construction codes, including the Building Code, and, as applicable, this code and the rules, and the applicable referenced standards listed in this code. Required systems shall be extended or altered as necessary to maintain and continue protection whenever the building or structure is altered. Alterations to fire protection systems shall be performed in compliance with the requirements of this code, the rules, and the construction codes, as applicable. Buildings and structures shall be provided with such fire hose, portable fire extinguishers and other means of preventing and extinguishing fires as the commissioner may direct.

901.4.2 Fire protection systems not required by code. Any fire protection system or portion thereof not required by this code, the rules or the construction codes, including the Building Code, may be installed to provide partial or complete protection of a building or structure, provided such system meets the requirements of this code, the rules and the construction codes, including the Building Code, as applicable. Where the design and installation of such fire protection system is governed by this code or the rules, the commissioner may modify such requirements, consistent with the interests of fire safety, upon a determination that such modification will promote public safety by encouraging the installation of such systems.

901.4.3 Additional fire protection systems. Where an existing or proposed storage, handling or use of a material or the conduct of an operation in a

particular occupancy gives rise to special hazards in addition to the normal hazards of the occupancy, or where the commissioner determines that size, design and arrangement of the occupancy would unduly delay the ability of firefighting personnel to gain access to the hazard, the commissioner may require additional fire protection or other fire safety measures. Such measures may include the following: automatic fire detection systems, fire alarm systems, fire extinguishing systems, standpipe systems, or portable or fixed extinguishers. Where a certificate of occupancy limits the commissioner's authority to order the installation of such additional systems or the implementation of such additional measures, the commissioner may apply to the Board of Standards and Appeals for a modification of such certificate of occupancy, and such application shall be granted upon a showing that such additional systems or measures will reasonably mitigate the special hazard or delayed access.

901.4.4 Prohibition of deceptive equipment. It shall be unlawful to install or maintain any device that has the physical appearance of fire protection equipment but that does not perform the fire protection function, in any building, structure or premises where it may be confused with actual fire protection equipment.

901.4.5 Certificate of approval. The following fire protection devices, equipment and systems shall be of a type for which a certificate of approval has been issued in accordance with this code, or which was approved by the Department of Buildings or the Board of Standards and Appeals prior to the effective date of this section, unless such approval by the Department of Buildings or the Board of Standards and Appeals is amended or repealed by the commissioner:

1. Pre-engineered non-water fire extinguishing systems, including systems installed in connection with commercial cooking systems.
2. Prefabricated hoods and grease filters installed in connection with commercial cooking systems.
3. Fire department connections, standpipe system hose outlets and pressure reducing valves.
4. Fire alarm control units, and medical gas, toxic, highly toxic and flammable gas detection system control panels.

901.5 Installation acceptance testing. Fire detection and alarm systems, fire extinguishing systems, private fire hydrant systems, yard hydrant systems, standpipe systems, fire pump systems, private fire service mains and all other fire protection systems and appurtenances thereto shall be subject to acceptance tests as set forth in the installation standards specified in this code. Where required by the construction codes, including the Building Code, this code or the rules, such tests shall be conducted, at the owner's risk, by his or her representative before a representative of the department.

901.5.1 Occupancy. It shall be unlawful to occupy any portion of a building or structure until any required fire detection system, fire alarm system, standpipe system and fire extinguishing systems have been tested and approved.

901.6 Maintenance. Fire protection systems shall be maintained in good working order at all times. Any fire protection system that is not in good working order shall be repaired or replaced as necessary to restore such system to good working order, or, where authorized by the Building Code, removed from the premises.

901.6.1 Standards. Fire protection systems shall be inspected, tested, serviced and otherwise maintained in accordance with this section, the rules and the referenced standards listed in Table 901.6.1. Where required by this section, such inspection, testing and maintenance shall additionally comply with the rules. Where applicable, the requirements of the reference standards listed in Table 901.6.1 shall be in addition to those requirements specified in the rules.

TABLE 901.6.1
FIRE PROTECTION SYSTEM MAINTENANCE STANDARDS

SYSTEM	STANDARD
Portable fire extinguishers	NFPA 10
Low, medium and high expansion foam systems	NFPA 11 and NFPA 25
Carbon dioxide fire extinguishing system	NFPA 12
Halon 1301 fire extinguishing systems	NFPA 12A
Foam water sprinkler and spray systems	NFPA 16 and NFPA 25
Dry chemical fire extinguishing systems	NFPA 17
Wet chemical fire extinguishing systems	NFPA 17A
Water based fire protection systems	NFPA 25
Fire alarm systems	NFPA 72
Water mist fire extinguishing systems	NFPA 750
Clean agent fire extinguishing systems	NFPA 2001
Aerosol fire extinguishing systems	NFPA 2010

901.6.2 Records. Records of all system inspections, tests, servicing and other maintenance required by this code, the rules or the referenced standards shall be maintained in accordance with FC107.7.

107.7 Recordkeeping. A written record of the inspections, tests, servicing, fire watch and other operations and maintenance required by this code, the rules, the referenced standards and any other required recordkeeping referenced therein, shall be maintained on the premises or other approved location for a minimum of 3 years, unless a different period of time is specified in such code, rules or referenced standards. The commissioner may prescribe the form and format of such recordkeeping. Such records shall be made available for inspection by any department representative, and a copy of such records shall be provided to the department upon request, without charge. The department additionally may require that certain records be filed with the department. Electronic filings may be made in lieu of paper filings, when approved.

901.6.2.1 Standpipe and sprinkler systems. In addition to those records required by NFPA 25, an approved card bearing the dates of each

inspection, certificate of fitness number and signature of the certificate of fitness holder shall be posted on the premises near the main water supply control valve. A detailed inspection report relative to conditions of water supply, gravity and pressure tanks and levels therein, valves, risers, piping, sprinkler heads, hose valves, hose and nozzles, fire department connections, alarms, fire pumps, obstructions, and conditions of all other system equipment and appurtenances shall be completed monthly by the certificate of fitness holder. All defects or violations shall be noted on the inspection report.

901.6.3 Supervision. A person holding a certificate of fitness for the following fire protection systems shall personally supervise the inspection, testing, servicing and other maintenance required by this code or the rules with respect to the system supervised by such certificate of fitness holder:

1. Sprinkler systems.
   Exception: Buildings classified in Group R-3 occupancies.
2. Standpipe systems.
3. Foam fire extinguishing systems.
4. Fire alarm systems.
5. Private fire hydrant systems.
6. Yard hydrant systems.

901.6.3.1 Servicing of portable fire extinguishers. It shall be unlawful for any person engaged in the business of servicing portable fire extinguishers to service portable fire extinguishers without a portable fire extinguisher servicing company certificate. Any person that services portable fire extinguishers shall hold a certificate of fitness, except that a person training for such certificate of fitness may service portable fire extinguishers under the personal supervision of a certificate of fitness holder. Nothing in this section shall preclude portable fire extinguishers that are maintained on a premises for use at such premises from being serviced by the owner or occupant of the premises, or an employee of such owner or occupant, who possesses a certificate of fitness for portable fire extinguisher servicing and the tools, materials, equipment and facility necessary to perform such services.

901.6.3.4 Smoke detector cleaning and testing. The cleaning and testing for smoke entry and sensitivity of smoke detectors installed in a defined fire alarm system shall be performed by a person holding a certificate of fitness for smoke detector maintenance. Such work shall be performed under the supervision and by employees of a person holding a smoke detector maintenance company certificate, except that such smoke detector cleaning and testing may be performed by an owner or occupant of the premises, or an employee of such owner or occupant, who possesses a certificate of fitness for smoke detector maintenance, and possesses the tools, instruments or other equipment necessary to perform such services in accordance this code and the rules. All other smoke detector maintenance shall be performed by a person possessing the requisite qualifications and experience, and any applicable license or certificate.

901.6.3.5 Central station fire alarm monitoring. It shall be unlawful for any person to operate a central station that monitors fire alarm systems and maintain transmitters in protected premises without a certificate of operation.

901.7 Out of service systems. The owner and the impairment coordinator for a standpipe system, sprinkler system or fire alarm system shall comply with the requirements of this section whenever such fire protection system is out of service. The department may direct that, until such fire protection system has been returned to service, fire safety measures appropriate to the size, configuration, occupancy, use and hazards be implemented that are in addition to or in lieu of those required by this section.

901.7.2 Fire watch. Unless otherwise directed by the department, the building shall be evacuated or a fire watch maintained in accordance with this section when a standpipe system, sprinkler system or fire alarm system is out of service. Such fire watch shall be conducted in compliance with the requirements of FC 901.7.2.1 through 901.7.2.3.

901.7.2.1 Duties and responsibilities. Persons conducting a fire watch shall:

1. continuously patrol the area affected by the out-of-service fire protection system to which such person has been assigned, keeping constant watch for fires;
2. be provided with at least one approved means for notification of the department and any FLS director, FEP coordinator or FEP staff on the premises;
3. immediately report any fire to the department and notify emergency preparedness staff on the premises;
4. be trained in the use of portable fire extinguishers and equipped with a portable fire extinguisher, or made aware of the location of readily accessible portable fire extinguishers in the area to which such person has been assigned to maintain a fire watch;
5. be responsible for extinguishing fires when they are limited in size and spread such that they can readily be extinguished using a portable fire extinguisher;
6. maintain a record of such fire watch on the premises during the fire watch and for a minimum of 48 hours after the fire watch has concluded; and
7. have no other duties.

901.7.2.2 Fire guards required. The fire watch required when a standpipe system, sprinkler system or fire alarm system is out of service shall be maintained in accordance with FC901.7.2.2.1 and this section.

901.7.2.2.1 Fire guards required. The fire watch required for an out-of-service standpipe system, sprinkler system or fire alarm system shall be maintained by one or more fire guards.

901.7.3 Planned removal from service. The impairment coordinator shall be made aware in advance of any planned removal from service of a standpipe system, sprinkler system or fire alarm system, or system component, for repair,

servicing, alteration, testing and other maintenance of the system or component, or to allow construction to be performed in the area protected by the system without unnecessarily activating it. The impairment coordinator shall authorize and personally supervise the placing of the fire protection system out of service. Before authorizing the placing of the fire protection out of service the impairment coordinator shall:

1. notify the certificate of fitness holder responsible for supervising the maintenance of the standpipe system, sprinkler system or fire alarm system.
2. determine the extent and expected duration of the out-of-service condition.
3. inspect the areas or buildings involved and assess the increased risks.
4. make appropriate recommendations to the owner.
5. notify the department in accordance with FC901.7.5, if required.
6. notify the responsible person designated by the owner to issue hot work authorizations in accordance with FC Chapter 26.
7. notify the central station and insurance carrier.
8. notify the occupants in the affected areas if the duration of time the sprinkler system or fire alarm system will be out of service is estimated to be more than 30 minutes.
9. place a tag at each fire department connection, standpipe and sprinkler system control valve and fire command center, indicating which fire protection system, or part thereof, is out of service.
10. maintain the fire protection system in service until work is ready to begin.

901.7.4 Unplanned out-of-service condition. Any person, upon becoming aware of any condition, except a planned removal from service, rendering a standpipe system, sprinkler system or fire alarm system, or part thereof, inoperable in whole or in part, shall notify the owner and the impairment coordinator of such condition. The impairment coordinator shall take the actions set forth in FC901.7.3 and 901.7.5, and such other actions as are necessary or appropriate to protect the occupants of the building and promptly restore the system to service.

901.7.5 Notification to department. The department shall be notified that a standpipe system, sprinkler system or fire alarm system is out of service, whether by reason of a planned removal from service or an unplanned out-of-service condition, where required by FC 901.7.5.1 through 901.7.5.3.

901.7.5.1 Standpipe systems. Notification shall be made to the department whenever a standpipe system is or will be out of service for any period of time.

901.7.5.2 Sprinkler systems and fire alarm systems. Notification that a sprinkler system or fire alarm system, or any part thereof, is or will be out of service shall be made to the department under the following circumstances:

1. The sprinkler system or fire alarm system is or will be out of service on more than one floor of a building; or
2. With respect to a sprinkler system, the work or repairs cannot be completed, and the system restored to service, within 8 hours of the time the system was placed or went out of service; or

3. With respect to a fire alarm system, the work or repairs will require the fire alarm system to be out of service for more than 8 hours in any 24-hour period; or
4. One or more other fire protection systems in the area in which a fire protection system is out of service are or will also be out of service at the same time.

901.7.5.3 Reporting requirements. Notification of an out-of-service condition pursuant to this section shall be made by the impairment coordinator to the Department at the applicable telephone number set forth in FC401.2.2. Such notification shall include the following information:

1. The owner or impairment coordinator's name and contact information;
2. The building address;
3. The type of fire protection system that is out of service;
4. Whether the fire protection system is out of service by reason of a planned removal from service (and if so, the reason for placing it out of service) or an unplanned out-of-service condition;
5. If a planned removal from service, the date and time the fire protection system will be placed out of service, and the estimated duration the system will be out of service;
6. If an unplanned out-of-service condition, the estimated duration the system will be out of service;
7. The floors or areas in which the fire protection system is out of service;
8. Whether the other fire protection systems are in good working order; and
9. The name and certificate number of the certificate of fitness holder responsible for supervision of the fire protection system that is out of service.

901.7.6 Restoring systems to service. When an out-of-service device, equipment or system is restored to service, the impairment coordinator shall:

1. conduct necessary inspections and tests to verify that the affected systems are operational.
2. notify the department.
3. notify the owner, central station, insurance carrier, emergency preparedness staff, and, if previously notified, the occupants in the affected areas.
4. remove the out-of-service tags.

901.7.7 Out-of-service standpipe systems at construction sites. The owner, fire safety manager and/or impairment coordinator shall take the following actions whenever a standpipe system at a construction site is out of service:

1. Immediately notify the department of any unplanned out-of-service condition, and otherwise comply with the requirements of FC901.7.4.
2. Notify the department at least 24 hours prior to any planned removal of the standpipe system from service, and otherwise comply with the requirements of FC901.7.3.
3. Ensure that a fire watch is continuously maintained in compliance with the requirements of FC901.7.2 while the standpipe system is out of service.
4. Repair the standpipe system and return it to service in compliance with the requirements of FC 901.7.6 and Section 3303.8.1 of the Building Code. The construction site may continue to be occupied, and construction, demolition

or alteration activities may continue, pending such repair and restoration to service, except:

4.1. as otherwise provided in Section 3303.8.1 of the Building Code; and/or

4.2. as otherwise directed by the commissioner upon a determination that, in the absence of an operable standpipe system, the conduct of certain construction, demolition or alteration activities would be imminently perilous to life or property; and

4.3. that in no circumstance shall hot work be conducted on the construction site until such time as the standpipe system is restored to service and the standpipe alarm reactivated.

901.8 Tampering with or rendering equipment inoperable. Fire protection systems and related apparatus shall not be tampered with or rendered inoperable, except as set forth in FC107.4.

901.9 Recall of fire protection system components. A component of a fire protection system regulated by this code that is subject to a voluntary or mandatory recall under federal law shall be replaced with an approved, listed component in compliance with the referenced standards. A record of the replacement of the component shall be maintained in accordance with FC107.7.

APPENDIX B

	LNG Container	Impounded Liquid	Process Equipment[6]	Vaporizers	Process Contr. Houses	Fire Pump House Fire Prot. Control	Marine Transfer Facilities	Critical Occupancy	Service Buildings	Property Line or Navigable Water	Boil-Off Compressor	Flare Stack or Ignition Source	Sewers, Undergrd. Ducts, Drains
LNG Container	250[2]		250[5]	250[5]	500	500	250[5]	1000[1]	250	250[2]	100	250[2]	500
Impounded Liq.			150	150	250[2]	500	250	1000[1]	250	200[2]		250	50
Process Equipment[6]	250[5]	150		100	100[3]	200	250	250	100	100		100	
Vaporizers	250[5]	150	100		200	200	250	250	200	100	100	100	
Process Contr. Houses	500	250[2]	100[3]	200			250	150	100		100	250	
Fire Pump House Fire Prot. Contr.	500	500	200	200			200	100	100		100	250	
Marine Trans. Facilities	250[5]	250	250	250	250	200		1000	100[4]	100	200	250	
Critical Occupancy	1000[1]	1000[1]	250	250	150	100	1000				100	250	
Service Buildings	250	250	100	200	100	100	100[4]				100	100	
Property Line or Navigable Water	250[2]	200[2]	100	100			100				100	100	
Boil-off Compressor	100			100	100	100	200	100	100	100		100	
Flare Stack or Ignition Source	250[2]	250	100	100	250	250	250	250	100	100	100		
Sewers, Undergrd. Ducts, Drains	500	50											

Figure 1.

Notes:
1. Hospitals, schools, places of assembly, bridges, tunnels, etc.
2. Or one and a quarter tank diameters, whichever is greater, except that tanks of not more than 2500 gallons shall be spaced according to the diameter criteria, but not less than 100 feet.
3. Except where a four-hour unpierced wall separates the control room from flammable liquid handling and explosion venting is provided.
4. For vessels up to 30,000 bbls. cap. Increase to 200 feet for vessels up to 50,000 bbls. and increase to 300 feet for vessels in excess of 50,000 bbls.
5. Or one tank diameter, which ever is greater.
6. Includes cold box.